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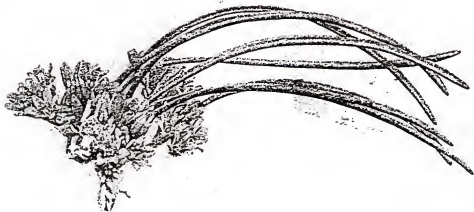
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INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT  
ANALYSIS OF VASCULAR PLANTS

1997

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## Preface

The following report was prepared by University scientists through cooperative agreement, project science staff, or contractors as part of the ongoing efforts of the Interior Columbia Basin Ecosystem Management Project, co-managed by the U.S. Forest Service and the Bureau of Land Management. It was prepared for the express purpose of compiling information, reviewing available literature, researching topics related to ecosystems within the Interior Columbia Basin, or exploring relationships among biophysical and economic/social resources.

This report has been reviewed by agency scientists as part of the ongoing ecosystem project. The report may be cited within the primary products produced by the project or it may have served its purposes by furthering our understanding of complex resource issues within the Basin. This report may become the basis for scientific journal articles or technical reports by the USDA Forest Service or USDI Bureau of Land Management. The attached report has not been through all the steps appropriate to final publishing as either a scientific journal article or a technical report.

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# INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT ANALYSIS OF VASCULAR PLANTS

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It is the hope of the authors that this document be a starting point for the recognition of the incredible diversity, richness and complexity of the flora, both vascular and non-vascular, of the interior Columbia Basin and that this resource be better understood and protected.

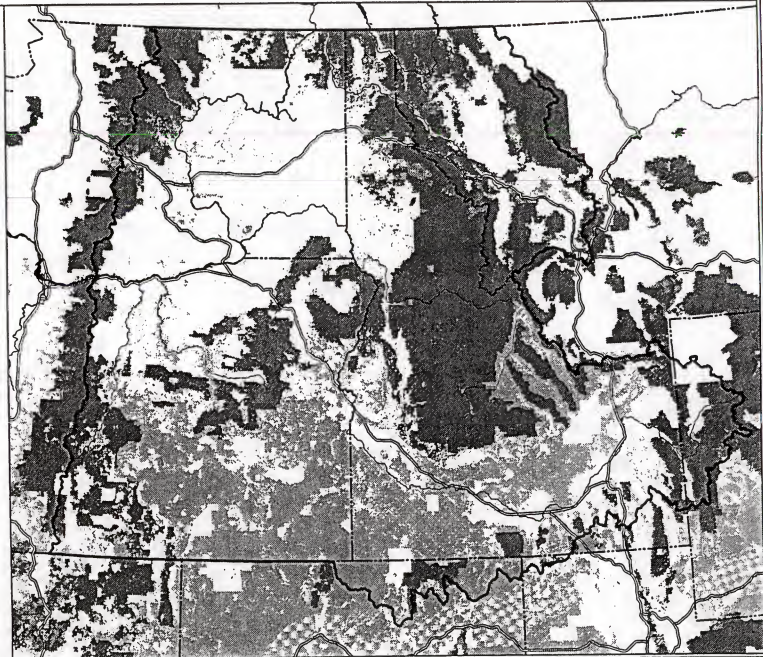
## INTRODUCTION

Vascular plants are the most ubiquitous and taxonomically diverse macroorganisms in the Interior Columbia Basin Ecosystem Management Project (ICBEMP) assessment area (Figure 1). These organisms function as primary producers, capturing sunlight and carbon, and producing oxygen, via the process of photosynthesis. As such, they are the most critical components in the maintenance of dynamic, functional ecosystems. Vascular plants provide foods for animals and fungi, stabilize watershed functions, provide habitat and cover for numerous organisms, influence climatic patterns on local and regional scales, contribute to soil development and stabilization, have specialized relationships with pollinators and seed dispersers, and provide a variety of other critical ecological functions such as nitrogen fixation. In addition to these essential ecological functions, vascular plants and plant communities (assemblages of species) provide the foundation for the economic and social fabric of the ICBEMP analysis area. Commercial resources critical to the region's economy are provided by vascular plants, including timber, forage, and other special plant products; these resources are harvested on both large and small scales. In addition, vascular plants are a very important part of the cultural history of native peoples in the Pacific Northwest. Thus, evaluation of the status of vascular plants is the most critical aspect of ecosystem analysis and management.

Owing to large-scale vegetation shifts related to climatic changes, the presence of a high diversity of geological substrates, and barriers to gene flow caused by mountainous topography and other geographical barriers, western North America has been an area of very active evolution for vascular plants. The flora of the ICBEMP assessment area reflects this history of divergence. The native flora of the Columbia River basin includes a spectacular diversity of plant taxa that range from geographically restricted endemics, some known only from one or a few occurrences, to those that are common and widespread across the ICBEMP assessment area. Vascular plant life forms range from the largest terrestrial organisms in the ICBEMP assessment area (trees up to 100 meters in height) to the smallest flowering plants known (aquatic plants in the genus *Wolffia*, the individuals of which are 1 mm or less in size). Especially noteworthy is the high number of endemic vascular plants whose ranges lie wholly or partially in the ICBEMP assessment area. There are 76 such plant taxa that are local endemics; these taxa are restricted to very small geographic areas (e.g., one portion of a mountain range, one canyon, etc.). Local endemics are often also restricted to highly specialized habitats, e.g., chemically unique rock outcrops such as serpentine. In addition, there are 70 plant taxa that are regional endemics; these have larger geographic ranges than local endemics, but are still confined to a relatively small region (e.g., southeast Washington, northern Idaho, and northwest Montana for a palouse grassland endemic). Regional endemics may also be closely associated with certain habitats, and their ranges may again lie either entirely within, or on, the ICBEMP assessment area boundary. An example of a local endemic is *Castilleja christii*, a species that occurs only on one single mountain summit in the Albion Range in south-central Idaho. *Penstemon lemhiensis*, an example of a regional endemic, occurs in four counties in southwest Montana and one county in adjacent east-central Idaho.

# BLM and Forest Service Administered Lands

- BLM-Administered Lands
- FS-Administered Lands
- Major Rivers
- Major Roads
- State Boundaries
- Columbia River Basin Assessment Boundary



ICBEMP

The evolutionary history and resultant floristic diversity of the analysis area is a reflection of the complexity of biophysical environments in the Columbia River basin. The influence of many of these environments has been manifested through natural selection in edaphically or physically unique habitats, e.g., chemically stringent substrates weathered from ultramafic (serpentine) or calcareous (limestone) bedrock, coarse-textured soils, and climatically harsh alpine environments. The presence of extreme environmental gradients with respect to temperature and moisture has also contributed to evolutionary diversification in the flora of the ICBEMP assessment area. The assessment area is unique in North America in containing habitats that range from extremely arid deserts to temperate rain forests, across elevations from sea level to over 14,000 feet. Owing to this floristic and environmental diversity, the Columbia River basin also contains a very large number of seral and climax plant community types.

The objectives of the ICBEMP vascular plant analysis were designed to contribute towards several broad goals outlined for the development of the Lower and Upper Columbia River Basin Environmental Impact Statements, including:

- an evaluation of the species and habitats currently of conservation concern.
- promote assurance of the viability of species through time.
- provision of information needed for the support of dynamic ecosystems.
- identification of the role of disturbance mechanisms in the maintenance of viability of species and rare habitats of conservation concern.

Specifically, ten analysis objectives of the Vascular Plant Task Group were used to contribute to these goals:

- summarization of biological, ecological and status information for plant taxa of rangewide conservation concern; these include federally listed or proposed taxa (threatened, endangered), federal candidate taxa (Category 1 and 2), and those taxa that are currently being recommended for such listing or candidate status.
- delineation of groups of species that are locally rare in the ICBEMP assessment area, by broad habitat categories.
- inventory and status assessment for rare plant communities.
- delineation of geographic areas that are important centers for endemism and high floristic diversity in vascular plants.
- determination of species of cultural importance to native American peoples in the interior Columbia River basin.

- delineation of research, development and application needs for further analyses of vascular plants.
- development of a preliminary checklist of the vascular flora of the interior Columbia River basin.
- inventory of conservation measures available for vascular plant species, including species conservation strategies, agreements and status reports (see Appendix 2), and *ex situ* conservation approaches.
- assessment of effects of EIS alternatives on vascular plant taxa of concern.
- development of objectives, standards and guides for: vascular plant taxa of federal and conservation concern, nonvascular plants and for habitats containing numerous state rare species within the ICBEMP.

With the exception of recommended mitigation measures (suggested standards and guides) found in the Conclusions section of this document, the assessment of nonvascular plants and fungi have not been included in this report with the exception of *Texosporium sancti-jacobi*, which is designated as sensitive by the BLM and Forest Service. The contract reports specific to bryophytes (Christy and Harpel 1995), fungi (Castellano 1994, Fogel 1994, Miller and Miller 1994, and Weber 1994), and lichens (Eversman 1994, Hammer 1995, Kaltenecker and Wicklow-Howard 1994, McCune 1994, Rosentreter 1995, Ryan 1994, Wicklow-Howard 1994, and Wicklow-Howard and Kaltenecker 1994) summarize the status of these species groups. Potentially rare taxa are discussed in each.

Given the broad goals of the ICBEMP scientific assessment, the Vascular Plant Task Group analysis represents a pioneering effort to integrate management and conservation of vascular plants into a basin-wide, biologically comprehensive approach to ecosystem management. This analysis uniquely spans government jurisdictional boundaries, and involved numerous federal, state, and local agencies and private organizations having an interest in plant conservation.

## METHODS AND RESULTS

### VASCULAR PLANT ANALYSIS AREAS

In order to adequately assess the status of plant species and plant communities of conservation concern, the ICBEMP assessment area was divided into thirteen "vascular plant analysis areas." This was necessary due to the large number of species and habitats needing evaluation, and to the large size of the ICBEMP assessment area. The vascular plant analysis areas, while not conforming to ecological or physiographic province boundaries in every case, were used in order to most efficiently examine the status of the vascular flora and plant communities via expert panels (described below). The 13 vascular plant analysis areas were Blue Mountains of Washington and Oregon, Columbia River Basin, East Cascades North, East Cascades South, High Lava Plains, Idaho North, Idaho South, Northern Nevada, Northern Utah, Okanogan Highlands, Oregon Basin and Range/Owyhee Uplands, Western Montana, and Western Wyoming.

Each analysis area had a coordinator who collected information for that area and assisted in the organization of panels, wrote the species narratives and introductions for their area. Coordinators were as follows: Kathy Ahlenslager, Okanogan Highlands, Columbia Basin, East Cascades North; Duane Atwood, Utah; Jerry Hustafa, Blue Mountains; Cathy Jean (with help from Amy Miller), Basin and Range, East Cascades South, High Lava Plains, Owyhee Uplands; Wayne Owen, Idaho North and South, Wyoming, Nevada; Steve Shelly, Montana.

Table 1 provides a crosswalk between the analysis areas and several other large-scale landscape delineations.

TABLE 1. Area Crosswalk for Vascular Plant Analysis

STATE	VASCULAR PLANT ANALYSIS AREA	PHYSIOGRAPHIC PROVINCE*	BAILEY SECTIONS*
Idaho	Idaho South	Basin & Range Owyhee Uplands Snake River Plains, East Snake River Plains, West	M331D M332E M332F 342B 342C 342D

Idaho	Idaho North	Idaho Batholith Palouse Northern Rocky Mtns.	M332A M332F M332G M333A M333D 331A
Oregon	Basin & Range	Basin & Range	M261G 342B
Oregon	Blue Mountains	Blue Mountains	M332A 342H
Oregon	East Cascades South	High Cascades	M242C 331A
Oregon	High Lava Plains	High Lava Plains	M242C 342B
Oregon	Owyhee Upland	Owyhee Upland	342C
Montana	Montana	Northern Rocky Mtns. Western Great Plains	M332A M332B M333B M333C
Nevada	Nevada	Basin & Range Owyhee Uplands	342B 342C
Utah	Utah	Basin & Range	342B
Washington	Columbia Basin	Columbia Basin	331A 342I
Washington	East Cascades North	Northern Cascades Southern Washington Cascades	M242C
Washington	Okanogan Highlands	Okanogan Highlands	M242C M333A
Wyoming	Wyoming	Teton/Overthrust Ranges Yellowstone Plateau	M331A M331D

\* Physiographic Province does not read directly across to Bailey Sections. These categories are presented strictly alphanumerically.

## The Blue Mountains of Washington and Oregon

The Blue Mountain Physiographic Province is situated in two states, Washington and Oregon. The southern boundary of this province is just north of Burns, Oregon, and the Harney Basin. From there it extends northeast through La Grande, Oregon, to just south of Pomeroy, Washington. The eastern boundary is clearly defined by the Snake River of Hells Canyon below the Seven Devils mountain range. From there, the Blue Mountains Province (BMP) extends west through John Day, to a few miles east of the confluence of the Crooked and Deschutes rivers near Prineville, Oregon.

Geologically, the BMP is remarkably complex. It spans an enormous variation in elevational ranges from canyons below 2,000 feet up through 10,000 foot mountain peaks. Several dominant mountain ranges punctuate the valleys, plains, canyons, plateaus, and hills of the BMP. The most notable ranges include the Ochoco, Strawberry-Aldrich, Greenhorn, Elkhorn, and Wallowa Mountains. The western portion of the BMP is comprised of ancient Paleozoic Era rock formations, including limestone, mudstone, sandstone, and siltstones (Franklin and Dyrness 1973). Later, Cenozoic Era vulcanism extruded deep layers of lava through numerous fissures to form the Clarno and Columbia River basalt flows (Johnson and Clausnitzer 1992). The Blue Mountains are thought to have uplifted through these basalt sheets (Johnson and Simon 1987). East of John Day, major ore deposits formed in the Strawberry, Greenhorn, and Elkhorn mountains during the Mesozoic Era. Here also the Columbia river basalts are prominent, surrounded by a matrix of Paleozoic formations comprised of schists, limestone, slate, argillite, tuff, chert, and siltstone (Franklin and Dyrness 1973). Mesozoic granitic rocks, limestones, shales and sandstones are prominently displayed in the Wallowa Mountains (Johnson and Simon 1987). Two dominant erosive events shaped these parent materials into the present terrain include hydrologic erosion and mass wasting and Pleistocene glaciation (Johnson and Simon 1987).

Soils within the BMP are highly variable due to the spectrum of parent material and weathering events. Two of the most influential events on soil development resulted from the ash deposits of Mt. Mazama and Glacier peak, and post glacial wind deposits of loess from central Washington (Johnson and Clausnitzer 1992). A majority of the soils fall into one of three broad categories: Residual, Ash-loess, and Mixed. Soil taxa development was further stratified by moisture and temperature regimes and is concisely summarized by McNab and Avers (1994). Plant communities evolving with this environment also played a key role in influencing the future development of vegetation and soil assemblages.

The enormous variation in topography, geology, elevation, and climatic factors create a well distributed mosaic of plant communities. The primary habitats found in the BMP are, Western ponderosa forest, Douglas-fir forest, Western spruce-fir forest, Juniper steppe woodland, sagebrush steppe, Wheatgrass-bluegrass grasslands and alpine meadows and barrens (Thomas 1979). Dissection of these habitats by stream action modification processes (Kovalchik 1987) has lead to a large degree of riparian habitat diversification at a local scale. At a broader scale, these general habitat types were influenced differently by the climatic forces mentioned above.

For example, the northern Blue Mountain foothills, slopes and ridgetops developed grasslands and rhizomatous shrublands via the influences of a maritime climate and the vegetation of the Palouse country to the north (Columbia Basin Province). This climatic regime also perpetuates pockets of refugia for plant species most often associated with habitat found west of the Cascade crest. By contrast, in the southern Blue Mountains the continental climate facilitates the development of sagebrush and juniper as commonly found in the Great Basin (Johnson and Clausnitzer 1992) to the south (Basin and Range Province).

The vegetation of the BMP has been further influenced by the actions of disturbance forces such as erosion, livestock or insects herbivory, and or fire. From the late 1800s through the mid 1900s millions of domestic sheep caused considerable changes in the plant communities of the BMP. Subsequent cattle grazing continues to confound the recovery from these impacts in many portions of the province. Historically, abundant late summer/early autumn convectonal lightning storms provided for cyclic annual fires (Johnson and Clausnitzer 1992). Prior to Euro-American settlement the BMP experienced low intensity surface fires in fire resistant seral habitats (i.e., ponderosa pine and grasslands) at intervals around 5 to 25 years. Stand replacement fires (in stands such as lodgepole and grand-fir stands) were as important but less frequent at 50 to 200 years (Arno 1992). Such fire events inspired the name Blue Mountains because of the smoky haze enveloping the region each summer.

These characteristics are responsible for the high level of floristic diversity, and the large number of local endemic plant species. The numerous designated sensitive plant species found in the BMP are also partly a result of this unique habitat. However, human activities have contributed to the rareness of many of these species.

### **Columbia River Basin**

The Columbia Basin encompasses about two-thirds of the area east of the Cascade Mountains in Washington. Topography includes gently undulating to moderately hilly slopes with isolated basaltic buttes and river cut canyons. Elevations range from about 400 ft. in elevation adjacent the Columbia River to about 1700 ft. Lava poured over most of the area during the Miocene epoch laying down a basalt layer. The channeled scablands is a unique geologic feature, comprising a series of dry deeply cut channels in the Columbia River basalt, forming a complex drainage network.

During the Pleistocene epoch, Palouse loess was deposited over much of the Province. The Palouse area is characterized by rolling hills and very fertile soils, which is now agricultural land. Most of the soils in this Province were formed under grassland or shrub-grassland vegetation. Precipitation is heaviest along the edge of the basin and decreases towards the center.

## East Cascades North

The Cascade Mountains are mostly comprised of ancient sedimentary rocks, which were folded, partially metamorphosed and intruded by large granitic batholiths. Valleys are deep and steep sided. The mountain crest is relatively uniform in elevation (5000-7300 ft.) with two dormant volcanoes (Mt. Baker) dominating the skyline. Extensive glaciation sculptured the features of the Province from the Canadian border south to Snoqualmie Pass. Soils to the east of the crest show the drier conditions under which they formed and are influenced by volcanic ash and loess.

The topography from Snoqualmie Pass south to the Columbia River is less rugged. Andesite and basalt flows are the dominate features on the landscape, which is a series of ridge crests separated by steep, deeply dissected valleys. Elevations of the crest are lower, from 3300-5600 ft. with three dormant volcanoes dotting the ridgelines (Mt. Rainier at over 12,200 ft., Mt. St. Helens and Mt. Adams). East of the crest soils are derived from andesite, sandstone or glacial till with textures of silt loams and loams.

## East Cascades South

The East Cascades physiographic province consists of scattered volcanic peaks, smaller cinder cones and gently sloping, high pumice plateau. A mantle of pumice and ash from numerous volcanic eruptions, notably Mount Mazama, blankets bedrock and influences the ecology of the area. The province is occupied by coniferous forests interrupted by mosaics of shrub-steppe, subalpine and alpine meadows, and barrens. Shasta red fir and mountain hemlock are found in the high elevation forests in the southern portion, and Oregon white oak is found in lower elevations along the Columbia River and Klamath River Drainage. Elevations range from near sea level on the Columbia River to over 10,000 feet at the summit of the major volcanic peaks.

## High Lava Plains

The High Lava Plains physiographic province consists of lava buttes, cinder cones and basaltic flows scattered across the region. Rhyolitic pumice from Newberry Crater (6400-1400 yrs bp) and Mount Mazama (7000-10,000 yrs bp) mantle much of the area. Paulina Peak, a shield volcano, is the largest volcanic peak. Fort Rock Valley, Christmas Lake and Fossil Lake held extensive bodies of water during the Pleistocene era. Today, playa lakes and basins with fluctuating water levels are common. *Artemisia* shrub-steppe and *Juniperus occidentalis* woodlands, tolerant of hot dry summers and cold winters, comprise the major vegetation types.

## Idaho North

The Northern Idaho Ecoregion includes both central and northern Idaho. This area includes the northern Rocky Mountains and the eastern margin of the Columbia Basin.

The Rocky Mountain province in Idaho is usually divided into northern and central Idaho subunits. The geology of the northern subunit is highly mixed with belts of Precambrian and Cambrian igneous, sedimentary and metasedimentary rocks, Tertiary volcanics, and Quaternary depositional features. The vegetation of this area is dominated by moist mixed-coniferous forests. Dominant overstory species include western white pine, western red cedar, western hemlock, Douglas fir, and true firs. Floristically, this area is relatively rich. This is especially true of the "maritime refugium", an area that harbors many species that are more typical of western Cascade forests. Central Idaho geology is dominated by the Idaho batholith (Cretaceous in age) with lesser amounts of Tertiary volcanics and Quaternary depositional features. The vegetation of the Idaho batholith is dominated by coniferous forest, especially ponderosa pine, lodgepole pine, and Douglas-fir with lesser amounts of true firs. Central Idaho lacks the species diversity of the northern portion of the state but has a greater range of habitat types due to a broad range of shrublands, grasslands, and high mountain (alpine and subalpine) meadows. Central Idaho is also rich with geothermally influenced plant communities.

The Columbia Basin margin in Idaho includes the Palouse, the Seven Devils, and Columbia Uplands (also known as the Breaks). The Palouse region is predominantly rolling hills of Pleistocene loess that can be as much as 150 feet deep. This region was once an expansive fescue/wheatgrass grassland with a rich component of herbaceous perennial forbs. The vast majority of this area has been converted to agriculture in the last century and several of the species that were formerly common there are now restricted to tiny remnants of intact habitat. The Seven Devils area is a fault blocked series of Miocene and Jurassic volcanics with significant areas of marine metasedimentary and metavolcanic rocks. The Seven Devils is primarily a shrubland (sagebrush) and grassland with minor intrusions of ponderosa pine and Douglas-fir. The Columbia Uplands are between the Seven Devils and the Palouse and consequently are dominated by mixtures of Pleistocene loess, Miocene basalts, some Tertiary age sedimentary rocks and minor areas of metamorphics. This area is dominated by floristically diverse grasslands that are rich in herbaceous perennial forbs with ponderosa pine occurring on higher mountain slopes. The grassland and shrublands at the margin of the Columbia Basin all share the problem of significant habitat degradation from introduced plant species.

## Idaho South

The southern Idaho Ecoregion includes the portions of the Owyhee uplift, the Snake River Plains, the Lemhi Range and Valley, the Lost River Range and Valleys, and the a portion of the Basin and Range province.

The Owyhee Uplift is a complex geological assemblage of Cretaceous granites (probably related

to the Idaho Batholith), Miocene rhyolites (from both magma and ash sources), Miocene and Pliocene basalts, a variety of metamorphic rock (gneiss and cherts and limestones of Permian age), and Quaternary alluvium and colluvium. The vegetation of the Owyhee Uplift is a diverse mixture of arid woodlands (*Juniperus* spp.), mixed shrublands, and coniferous forests (Douglas-fir). The flora of this area is very rich in endemic species, a reflection of its isolation and azonal geology.

The geology of the Snake River Plains are dominated by igneous features. The western Snake River Plains are comprised of late Miocene and Pliocene olivine basalts mixed with welded ash and overlain by Pleistocene basalt flows. The eastern Snake River Plains generally lack the older olive basalts and has some more recent volcanic features (e.g., cinder cones). Both areas have a variety of Quaternary alluvial, colluvial, and lacustrine deposits and some active sand dunes. The Snake River Plains were once dominated by perennial grasses and shrubs with a rich ephemeral flora of herbaceous perennial. Much of this area has been converted to agricultural use or has been degraded from livestock grazing, exotic plant species, and an increased fire frequency. In areas of more recent volcanism on the eastern Snake River Plain there are large areas totally devoid of vegetation. The Snake River Plain is significantly more arid in its western reaches and in that area salt scrub type vegetation is commonly encountered. The Lemhi and Lost River Ranges and there valleys a Basin and Range fault blocks that were isolated from the rest of the rest of the Basin and Range during the Pliocene.

The Basin and Range region of southeastern Idaho is an area of high topographic relief that is a result of extensive fault blocking during the Pliocene. The geology of the area is mixed and include a variety of Quaternary depositional features, Pliocene volcanics (ejecta, welded tuff, ash and flow rocks), Eocene granitic plutons, and marine sediments of much greater age. The Basin and Range regions of Idaho are dominated by sagebrush/bunchgrass habitats. There are however significant areas of pinyon/juniper woodlands and dry forests at higher elevations (Douglas-fir, lodgepole pine, and subalpine fir). The Basin and Range is also notable for its extensive aspen forests. This area is relatively rich floristically, a result of a diverse geologic history, steep gradients in topography and the isolating effects of remote mountain ranges inbedded in a sea of arid lowlands.

### Northern Nevada

The Nevada portion of the Columbia River Basin is usually considered as a portion of the Owyhee Uplands (see Southern Idaho report). This area is a complex geological assemblage of Cretaceous granites, Miocene rhyolites (both from magma and ash sources), Miocene and Pliocene basalts, a variety of metamorphic rock (gneiss and cherts and limestones of Permian age), and Quaternary alluvium and colluvium. The vegetation of the Nevada portion of the assessment area is a diverse mixture of arid shrublands and grasslands, Juniper and Pinyon-Juniper woodlands, coniferous forests (Douglas-fir), and high elevation forb-graminoid meadows and open subalpine fir forests (often with scattered whitebark pine). Riparian areas in

this area are important sources of habitat diversity throughout this portion of Nevada but have been very heavily impacted by livestock grazing.

### Northern Utah

The Raft River and Goose Creek mountains were formed in post-Cretaceous times by an intrusive upheaval. The Raft River Mountains (trending east-west) and the Goose Creek Mountains (trending north-south) are located in the northwestern part of Box Elder County, Utah covering an area 45 miles by 10 miles. They rise from 6000 feet on the north and 5000 feet on the south, to nearly 10,000 feet at the highest point. Northern slope streams of the Raft River and Goose Creek mountains drain into the Raft River and Goose Creek respectively and then empty into the Snake River near Burley, Idaho. Together these ranges form part of the northern boundary of the Great Basin.

These isolated desert ranges are an important floristic element of the southern portion of the Upper Columbia River Basin (UCRB). Thirty-two rare, disjunct or edge-of-range species are located in this part of Utah. Most of these species are at the south edge of their range and a few are at the north edge of their range, making this a unique merging area. The complex mix of climate, isolation, topography, geology and biotic factors are important in the make up of the plant communities and floristic richness. Primary habitat types for the Raft River sub-unit are pygmy forest, riparian, coniferous forest and alpine tundra. The Goose Creek area lacks the coniferous and alpine community types. Very little is known about the vegetation types in the Goose Creek area. Storm patterns in this region are from the north, and since the mountain range lies primarily east-west, most of the precipitation of the area is dropped on the north slope. North to south winds have had significant influence on seed dispersal from northern communities into this area. The conifer community is primarily on the north slope due to cooler temperatures and higher precipitation. Riparian vegetation has been significantly altered by livestock grazing. The mountain meadows of higher elevations have dense stands of poisonous sneeze weed and false hellebore. It appears that livestock and deer grazing may have resulted in changes of grasslands and forb communities to sage brush which is being converted to juniper stands on the lower south slopes. The general contour of the Raft River section is rounded and gentle sloping except in canyons, small draws and pockets. These offer little opportunity for the existence of microclimates required for more mesophytic vegetation communities. Limestone parent materials are lacking which reduces the potential for a higher degree of endemism.

Because the Goose Creek/Raft River area is on the southern edge of the UCRB, the plant species occurring in the area are probably under stronger selection pressure than they are towards the center of their range. These pressures may have led to unique genetic adaptations. Four new species have been described in the area in the last decade and these are based on limited field work. Insufficient data are available on these rare species to address specific biological factors to determine their requirement and contribution to the habitat they occupy.

## Okanogan Highlands

The Okanogan Highlands Province is characterized by upland areas separated by a series of broad north-south valleys. Slopes are moderate with broad, rounded summits. Most of the area is over 3300 ft. in elevation, although the main river valleys are lower and a handful of peaks reach to 7000 ft. The entire Province was covered by glacial ice during the Pleistocene epoch, resulting in deposits of glacial drift. Numerous rock types form a complex pattern of substrates ranging in age from Precambrian to late Tertiary.

In this Province soil pattern is tied to elevation. Soils in mountainous areas are derived from granitic parent materials, while those from glacial materials often have volcanic ash. Surface layers generally have silt loam texture and subsoils are gravelly loam. Lower in elevation, along river valleys and the southern border of the Province, soils formed under a drier climate with transitional forest-grassland vegetation with soil textures of sandy loam to loam. At the lowest elevations, along major river terraces and floodplains, soils are coarse textured and well drained with parent materials of glacial outwash sands and gravels.

## Oregon Basin and Range, Owyhee Uplands

The Basin and Range Province consists of fault-block mountains and intervening basins characterized by internal drainage (Franklin and Dymess 1973) and often containing shallow, saline lakes. Principal mountain ranges include Winter Rim, Abert Rim, the Pueblo and Trout Creek Mountains, Hart Mountain and Steens Mountain. Steens Mountain (elevation 9500 feet), a major northeast striking and gently west-northwest dipping fault block, encompasses the greatest contiguous area of high elevation lands within the province. The landform consists of rhyolitic extrusions, subordinate tuffs, and sedimentary rocks overlain by Steens Basalt (15.5-Ma), breccias and pyroclastics (Minor et al. 1988). Deep U-shaped canyons on the west slope are the result of Pleistocene glaciation. The Owyhee Uplands Province is characterized by less frequent faulting and generally less topographic relief than the Basin and Range province. It is principally drained by the Owyhee River which flows north into the Snake River. The geology of both provinces is comprised predominately of Miocene and Quaternary volcanics, and the diversity of substrates found within the region accounts for much of the habitat diversity. The ash beds of the Leslie Gulch and Succor Creek area (Owyhee Uplands), for example, support a number of local endemics. Elevations within the provinces range from 1,200 to 2930 meters (3900 to 9610 feet).

Low precipitation in the provinces (mean annual ppt. 180 to 300 mm (7 to 12 inches)) supports little more than dry shrubland, as forests are rare outside of riparian areas. The principle vegetative formation is big sagebrush (*Artemisia tridentata*) shrub-steppe (Franklin and Dymess 1973). *Juniperus occidentalis* and bunchgrasses, including *Festuca idahoensis*, *Agropyron spicatum*, and *Elymus cinereus*, are common associates. *Artemisia arbuscula* and *A. rigida* communities are found on shallow, stony soils, while *A. cana* communities are found in moister bottomlands. Salt desert shrub communities are common in the alkaline soils of basins and lake

margins and are generally dominated by *Atriplex confertifolia* and *Sarcobatus vermiculatus*. Higher order riparian areas commonly support gallery forests dominated by *Populus tremuloides* and/or *Populus trichocarpa*. *Salix* spp., may occur in similar habitat, or within wet meadows dominated by species of *Carex*.

## Western Montana

The Montana ecoregion of the upper Columbia River Basin is typified by great variation in topography, vegetation types, geological characteristics and history, and climate. This highly varied environment, typical of the northern Rocky Mountains, creates a mosaic of forest, shrubland and grassland vegetation. In addition, wetland and alpine habitats, while occupying less landscape area than the latter vegetation types in many areas, contribute substantially to floristic and plant community diversity in western Montana. Species composition and productivity differ greatly within and among these major vegetation types (Mueggler and Stewart 1980).

The distribution of forest tree species and associated habitats in southwestern Montana, arranged by increasing altitude, is as follows: grassland (valley bottoms)/*Pinus flexilis* (limber pine)/*Pseudotsuga menziesii* (Douglas-fir)/*Pinus contorta* (lodgepole pine)/*Picea engelmannii* (Engelmann spruce)/*Abies lasiocarpa* (subalpine fir)/*Pinus albicaulis* (whitebark pine)/alpine tundra. In northwestern Montana, this elevational series is as follows: grassland (valley bottoms)/*Pinus ponderosa*/Pseudotsuga menziesii/Picea engelmannii/Abies grandis/Thuja plicata/Tsuga heterophylla/Abies lasiocarpa (Tsuga mertensiana)/Pinus albicaulis/Larix lyallii/alpine tundra (Pfister et al. 1977).

Grassland and shrubland habitats of western Montana have been classified into 13 and 16 habitat types, respectively, within 13 climax series (Mueggler and Stewart 1980). The five climax series for grasslands include the *Agropyron spicatum*, *Deschampsia caespitosa*, *Festuca idahoensis*, *Festuca scabrella* and *Stipa comata* series. The eight shrubland climax series include *Artemisia arbuscula*, *Artemisia tridentata*, *Artemisia tripartita*, *Cercocarpus ledifolius*, *Potentilla fruticosa*, *Purshia tridentata*, *Rhus trilobata* and *Sarcobatus vermiculatus* series (Mueggler and Stewart 1980).

General wetland habitats represented in western Montana include peatlands, riparian habitats, aquatic habitats, forested wetlands, and emergent wetlands. Alpine habitats occupy the least amount of acreage, on a landscape scale, but numerous rare species and uncommon vegetation types are entirely confined to these harsh environments (Lackschewitz 1991).

The Montana portion of the analysis area is prominently mountainous with intervening valleys. In northwestern and west-central Montana, valley base elevations range between 2,000 and 4,000 feet, and support either forests or grasslands. The major mountain ranges rise to elevations of 7,000 to 9,000 feet. These mountains support extensive forests up to subalpine levels, with a

small amount of landscape area above the alpine timberline. In the southwestern portion of the state the grassy intermountain valleys are higher, generally 4,500 to 6,500 feet, and the major mountain ranges usually rise to 10,000 feet or higher (Pfister et al. 1977).

The surface geologic formation prevalent throughout most of northwestern Montana is the Precambrian Belt Series, consisting primarily of quartzites and argillites. The Idaho and Boulder Batholiths comprise the Bitterroot Range west of the Bitterroot Valley and much of the southern Sapphire and Anaconda-Pintlar ranges, as well as the mountains along the Continental Divide from Butte to Helena; their composition is predominantly granitic with inclusions of gneiss and schist. Volcanic and sedimentary rocks (both limestone and non-limestone) constitute most of the remainder of the Montana Rocky Mountains (Pfister et al. 1977). Many of the mountain areas near or east of the Continental Divide are geologically complex in contrast to areas farther west (Perry 1962).

Most of the prominent valleys in the Montana Rocky Mountains contain a layer of alluvium deposited by streams and glacial action. The majority of these areas support grassland, riparian, or cultivated vegetation, although substantial areas in northwestern Montana valleys support forests (Pfister et al. 1977).

Forest soils in western Montana are typically quite rocky, reflecting their mountainous setting. Because steep topography and rocky soils are so prevalent, sites capable of supporting a climatic climax are scarce over much of the forested landscape (Pfister et al. 1977).

The Continental Divide exerts a marked influence on the climate of Montana. West of the Continental Divide, the area has an inland climate strongly modified by moisture-laden air masses from the Pacific Ocean; precipitation is rather evenly distributed throughout the year, except for a dry period in July and August. East of the Continental Divide, the climate is decidedly continental. It is characterized by warm summers, with a high proportion of the precipitation falling between May and September and winter conditions consisting of invasions of subzero air followed by warm dry Chinook winds. Elevation also has a major effect on climate and thus on vegetation patterns. Except in extreme northwestern Montana, lowlands are semiarid and support either grassland or very dry forest types. Mountains are much cooler and often receive two to three times as much annual precipitation, most of it as snow. Above 8,000 feet in northern Montana and 9,500 feet in southern Montana, forests give way to alpine tundra. About 25 mountain ranges in the state support some tundra, which develops on sites having mean July temperatures of less than 50 degrees F (Arno 1970). Thus, the lower elevational limits of coniferous forests are controlled primarily by moisture, while the upper elevational limits are controlled primarily by temperature.

## Western Wyoming

The Wyoming portion of the Columbia River Basin includes the west slope of the Teton Range, and portions of the Yellowstone Plateau.

The Tetons are a tilted Tertiary high angle fault block range that reaches elevations in excess of 13,000 ft.. The geology is a complex of Precambrian igneous and metamorphic rocks (gneisses and schists). The lowlands on the west slope of the range (the Columbia River Basin side) are overlain with mostly Tertiary volcanics. The east slope of the Tetons are heavily altered by Pleistocene glaciation. The vegetation of the Tetons is dominated by coniferous forests, primarily Doug-fir, lodgepole pine, and subalpine fir. At higher elevations, mixed forb and graminoid meadows are common. Talus and snowbank communities comprised mostly of perennial forbs are also common though usually small in extent.

The Yellowstone region of the assessment area is a heavily forested volcanic plateau surrounded on three sides by high relief mountain ranges and to the west by the Snake River High Plains. Yellowstone Lake occupies a small portion of the much larger Yellowstone caldera in the east central portion of the plateau. The volcanic geomorphology of the area is largely the result of two periods of activity, one in the late Cretaceous-early Tertiary and the other in middle to Late Tertiary times. Material from the former event is predominantly breccias, agglomerates, and flow basalts. The latter period produced extensive areas of rhyolite and welded tuff. A third period of volcanism that has left more recent marks on the surface geology of the Yellowstone landscape. Quaternary eruptions that formed the Yellowstone caldera (600,000 years ago) subsequently produced extensive rhyolite flows (2,000 feet thick in places). The volcanism and geothermal activity of Yellowstone is the result of tectonic migration of the underlying plate over a stationary mantle convection plume. The geothermal features of Yellowstone Park are largely located above zones of ring fractures within the Yellowstone caldera. Portions of the Yellowstone Plateau were glaciated in at least three distinct events during the Pleistocene.

The vegetation of the Yellowstone area is dominated by lodgepole pine and Doug-fir forests. There are however extensive graminoid meadow lands throughout the area with mixed forb-graminoid meadows being less common yet still frequent. In close proximity to many of the hydrogeothermal features there are barren communities made up of a small number of vascular plants (often grasses), algae, and cyanobacteria.

## VASCULAR PLANT EXPERT PANEL PROCESS

The vascular plant expert panels included plant taxonomists and plant ecologists, from academia, federal and state government agencies and the private sector, who are familiar with the flora and vegetation in each analysis area. A large percentage of the professional botanical community in the ICBEMP assessment area was involved in the project via these panels. The intent of the

expert panel process was to compile biological information and key environmental factors that affect the distribution, viability, health, fitness, abundance and trends of plant taxa or species groups in the ICBEMP assessment area. The panel process provided a means to compile "key environmental correlates" that affect populations or habitats of plant species, and that are not always available via extensive literature searches. Especially important information can reside in personal experience and observations, unpublished data and reports, and other "grey literature." Utilizing discussion and professional interaction, the panel process was designed to precipitate this information from the panel experts. Four separate analyses (the methods used for each are described below) were conducted by each panel; they included:

- Evaluation of vascular plant taxa of rangewide conservation concern.
- Analysis of habitat groups for other rare taxa.
- Delineation and status review of rare plant communities.
- Identification and description of areas of endemism and high floristic diversity.

The Science Integration Team constructed a species information form for use in capturing the panelists' knowledge and information, and to convert those data into a database. A scribe also recorded data and information that evolved out of discussions, and that were not readily captured on the form.

## INFORMATION REQUEST AND RESULTANT CONTRACTS

Information regarding the abundance, trend, and viability assessments needed for sensitive plant species was requested from botanists on National Forests and BLM districts throughout the ICBEMP analysis area. This survey also included an inventory of existing conservation strategies, management guides, or similar plans for these taxa. Based on the results of this survey, assessments of species and habitat groups in five taxonomically complex genera were completed as separate contracts by individual experts; these genera included *Allium* (McNeal 1995), *Botrychium* (Zika 1995), *Carex* (Brainerd et al. 1995), *Mimulus* (Meinke 1995a), and *Penstemon* (Meinke 1995b). These assessments were subsequently peer-reviewed by members of the professional botanical community prior to incorporation into the ICBEMP vascular plant databases.

## ANALYSIS COMPONENTS

The analysis for vascular plants consisted of eleven primary components. The first four analysis components were completed by the vascular plant expert panels, as outlined above; the remainder were accomplished by members of the Vascular Plant Task Group, ICBEMP Terrestrial staff members, or by independent contractors. Brief descriptions of each of the eleven components, including the methods for each, are as follows:

## Vascular Plant Taxa of Rangewide Conservation Concern

As required by the charter for the ICBEMP, a primary focus of the vascular plant analysis was on taxa of conservation concern across their entire geographic ranges. These taxa include those currently listed as threatened or endangered under the federal Endangered Species Act, those that are candidates (Category 1 or 2) or officially proposed for such listing, and those with no current status that were recommended by the vascular plant expert panels for federal listing or candidate status. In some cases, species that were formerly Category 1 or 2 candidates, but are now in Category 3 (no longer being considered for federal listing), were also evaluated. Recent changes (Federal Register, vol 61, no. 40, 7596) were made to the list of species of plants and animals that are regarded as candidates for possible addition to the List of Endangered and Threatened Wildlife and Plants under the Endangered Species Act. These changes dropped the classifications of Category 1, Category 2, and category 3c in favor of simply listing species as candidates for listing. Most of the species that were classified as Category 1, 2, and 3c taxa are no longer included in the list of candidate species. These changes are not reflected in the references made to candidate species in this document.

Specific objectives for this analysis included the assignment of these taxa to five geographic distribution categories (local endemic, regional endemic, scattered, disjunct, and peripheral; defined below); delineation of critical environmental correlates, associated cover types (including climax and seral cover types), and threats for each taxon; assessment of species viability by analysis of the distribution of habitat, trends, threats, and number of occurrences for each; identification of primary threats to each taxon; and development of mitigation and management recommendations for the taxa where needed or appropriate.

Definitions for the geographic distribution categories are as follows:

- **local endemic** - populations are restricted to a very small geographic area (i.e., one portion of a mountain range, one canyon, etc.); these taxa are often also restricted to highly specialized habitats, and their range may lie either entirely within, or on, the ICBEMP Assessment Area boundary.
- **regional endemic** - populations inhabit a larger geographic area than that of a local endemic (i.e., southeast WA, northern ID, and northwest MT for a palouse endemic); these taxa may also be closely associated with certain habitats, and their range may lie either entirely within, or on, the ICBEMP Assessment Area boundary.
- **scattered** - populations are sparsely distributed within and outside the ICBEMP Assessment Area; the overall geographic range of these taxa is wide (i.e., they may be found in many western states), but they are nowhere common on the landscape.

- **disjunct** - populations within, or straddling, the ICBEMP Assessment Area boundary are substantially separated geographically from the remainder of the taxon's range.
- **peripheral** - populations within, or straddling, the ICBEMP Assessment Area boundary lie on the margin of the taxon's range, and are geographically contiguous with that range.

These species evaluations are a critical aspect of addressing the viability requirements included in the National Forest Management Act and the Federal Land Policy and Management Act. Due to the vast size of the analysis area (144 million acres), varying degrees of appropriateness of "fit" to the scale of analysis used in the ICBEMP were realized in analyzing the viability of plant taxa. Two broad categories emerged during the analysis: those plant species that could be modelled within the ICBEMP cover type and structural stage hierarchies using known environmental correlates, and those that could not be modelled owing to a lack of species-specific information and/or because of a "lack of fit" with the broad and mid-scale analysis levels. The latter case usually involved plant taxa that are tightly confined to highly specialized habitats that occupy very small ( $< 1 \text{ km}^2$ ) patches on the landscape, and which could thus not be resolved at the broader analysis scales.

Utilizing a variety of federal, state, and private data sources, the ICBEMP database manager compiled a list of all federal threatened, endangered, and proposed plant taxa, as well as those taxa designated as sensitive or otherwise of conservation concern by the U.S. Forest Service or the Bureau of Land Management. This list was then subdivided into 13 lists, each specific to one of the panel analysis areas. Taxa not currently listed, proposed or designated as candidates were also added to the panel lists, as deemed necessary by the panel members. Biological, ecological and status information for a total of 168 taxa were evaluated in this analysis. This analysis included the preparation of range maps for each taxon; these are presented in Appendix 1.

To initiate the expert panel process, all panel members completed an environmental correlate form as a group for the first taxon on their analysis area list. This was done to ensure that all members were interpreting and completing the forms consistently. Subsequently, the panelists then independently filled out forms for individual taxa on the analysis area list according to their knowledge of each one. After all forms were completed, each panelist verbally recounted the information he or she had recorded. A discussion about each species ensued for the purpose of information-sharing and to stimulate each panelist to add or elaborate on data or key environmental correlates. The content of these discussions was captured by the panel scribe. If, as a result of the discussion, any of the experts thought of needed additions to their forms, they took a brief time to edit them. However, they were instructed not to reach consensus if disagreements appeared, nor to write down what other experts were saying if it was not also part of their own experience with that taxon. When all forms were completed they were collected for subsequent entry into the ICBEMP vascular plant database.

Figure 2 is a map of the ICBEMP assessment area with information on the number of element occurrences over the number of taxa by county (Figure 2) which provides some information on areas of high concentrations of species that are tracked by heritage programs. Many of the

species of conservation concern from this project were local endemics, this map reflects many of these species that have highly localized distributions.

Table 2 is a summary of the best available data at the time this report was prepared for each of the species of conservation concern. It presents a summary of species by geographic distribution. The table is followed by narratives for each species.

TABLE 2. List of Species of Conservation Concern by geographic distribution.

### Locally Endemic Species

*Abronia ammophila*  
*Agrostis rossiae*  
*Allium aaseae*  
*Allium dictuon*  
*Amsinckia carinata*  
*Arabis suffrutescens* var. *horizontalis*  
*Artemisia ludoviciana* ssp. *estesii*  
*Astragalus anserinus*  
*Astragalus applegatei*  
*Astragalus atratus* var. *inseptus*  
*Astragalus collinus* var. *laurentii*  
*Astragalus columbianus*  
*Astragalus howellii*  
*Astragalus sinuatus*  
*Astragalus tyghensis*  
*Astragalus vexilliflexus* var. *nubilus*  
*Balsamorhiza rosea*  
*Botrychium pumicola*  
*Calochortus longebarbatus* var. *peckii*  
*Calochortus macrocarpus* var. *maculosus*  
*Castilleja christii*  
*Castilleja cryptantha*  
*Castilleja pilosa* var. *steenensis*  
*Castilleja rubida*  
*Chrysothamnus parryi* ssp. *montanus*  
*Claytonia lanceolata* var. *flava*  
*Cymopterus davisii*  
*Delphinium viridescens*  
*Draba trichocarpa*  
*Erigeron basalticus*  
*Erigeron lackschewitzii*  
*Erigeron salmonensis*  
*Eriogonum chrysops*  
*Eriogonum meledonum*

*Erythronium grandiflorum* var. *nudipetalum*  
*Hackelia venusta*  
*Haplopappus insecticuriis*  
*Ivesia rhypara* var. *shellyi*  
*Lathyrus grimesii*  
*Leptodactylon glabrum*  
*Leptodactylon pungens* ssp. *hazeliae*  
*Lesquerella carinata* var. *languida*  
*Lesquerella humilis*  
*Lomatium erythrocarpum*  
*Lomatium greenmanii*  
*Lomatium ochocense*  
*Lomatium tuberosum*  
*Luina serpentina*  
*Lupinus cusickii*  
*Mimulus hymenophyllus*  
*Mimulus patulus*  
*Mirabilis macfarlanei*  
*Oenothera psammophila*  
*Oxytropis campestris* var. *wanapum*  
*Penstemon compactus*  
*Penstemon idahoensis*  
*Penstemon peckii*  
*Petrophytum cinerascens*  
*Phacelia lenta*  
*Phacelia lutea* var. *calva*  
*Phlox idahonis*  
*Physaria didymocarpa* var. *lyrata*  
*Primula alcalina*  
*Ranunculus reconditus*  
*Rubus bartonianus*  
*Rubus nigerrimus*  
*Saxifraga bryophora* var. *tobiasiae*  
*Senecio erterae*

*Sidalcea oregana* var. *calva*  
*Stilene seelyi*  
*Stephanomeria malheurensis*  
*Tauschia Hooveri*

# Regionally Endemic Species

*Ullama longisepala*  
*Ivestia rhypara* var. *rhypara*  
*Lepidium davisi*  
*Lepidium papilliferum*  
*Lesquerella carinata* var. *carinata*  
*Lesquerella paysonii*  
*Lesquerella pulchella*  
*Limnathes floccosa* var. *bellingeriana*  
*Lomatium suksdorfii*  
*Lupinus biddiei*  
*Mentzelia mollis*  
*Mentzelia packardiae*  
*Mimulus amplifolius*  
*Mimulus clivicola*  
*Mimulus evnascens*  
*Mimulus jungermannioides*  
*Mimulus pygmaeus*  
*Mimulus washingtonensis* var.

*Oryzopsis hendersonii*  
*Oryzopsis wallensis*  
*Oxytropis campestris* var. *columbiana*  
*Papaver pygmaeum*  
*Pensstemon barreletiae*  
*Pensstemon glauclivus*  
*Pensstemon lemhiensis*  
*Phacelia minutissima*  
*Physaria integrifolia* var. *monticola*  
*Pleurapogon oregonus*  
*Polemonium pechinatum*  
*Potentilla coltami*  
*Silene spaldingii*  
*Slamleya confertifolia*  
*Thelypodium eucosmum*  
*Trifolium douglasii*  
*Trifolium owyheense*

**Scattered Species**  
*Antennaria arcuata*  
*Botrychium ascendens*  
*Botrychium crenulatum*  
*Botrychium paradoxum*  
*Botrychium pedunculatum*  
*Collomia renata*  
*Cymopterus nivalis*

**Disjunct Species**  
*Antennaria arcuata* var. *sukdorsii*  
*Mustineon lineare*  
*Parnassia kotzebui* var. *pumila*

**Peripheral Species**  
*Carex lenticularis* var. *dolia*  
*Sisyrinchium sarmentosum*






*Perideridis erythrorhiza*  
*Sullivantia hapemanti* var. *hapemanti*  
*Tofieldia glutinosa* ssp. *absona*

*Cypripedium fasciculatum*  
*Howellia aquatilis*  
*Meconella oregana*  
*Oryopsis contracta*  
*Phacelia inconspicua*  
*Rorippa columbica*  
*Thelypodium howellii* var. *howellii*

# Number of Occurrences / Number of Taxa

## LEGEND

Number of Occurrences

-  0-49
-  50-199
-  200-299
-  300-443
-  State Boundaries

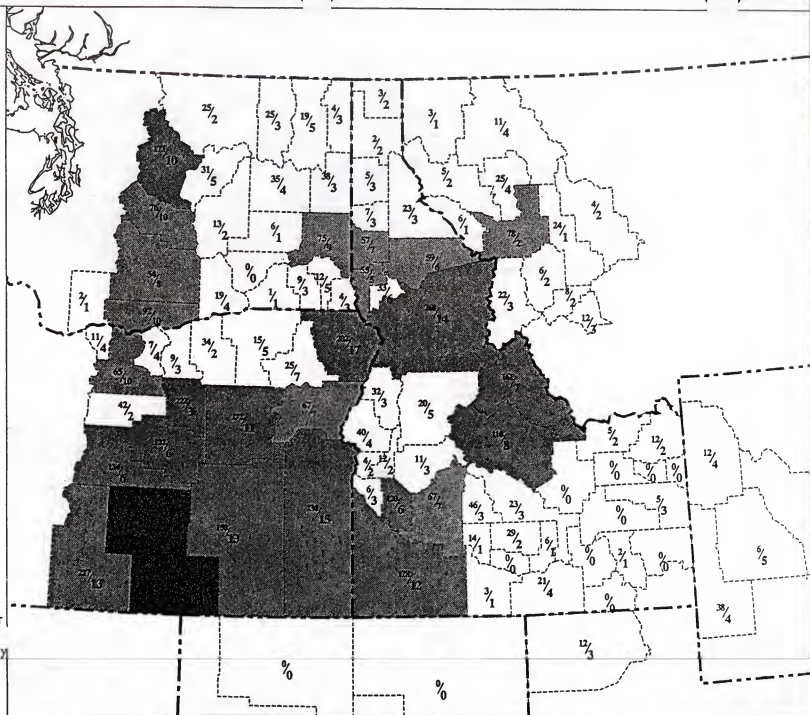


Figure 2. Map of the ICBEMP compiled from state Heritage Program data showing the number of element occurrences over the number of taxa found in the county.

ICBEMP

# Number of Taxa / Number of Occurrences

## LEGEND

Number of Taxa

12-17

6-11

0-5

△ State Boundaries

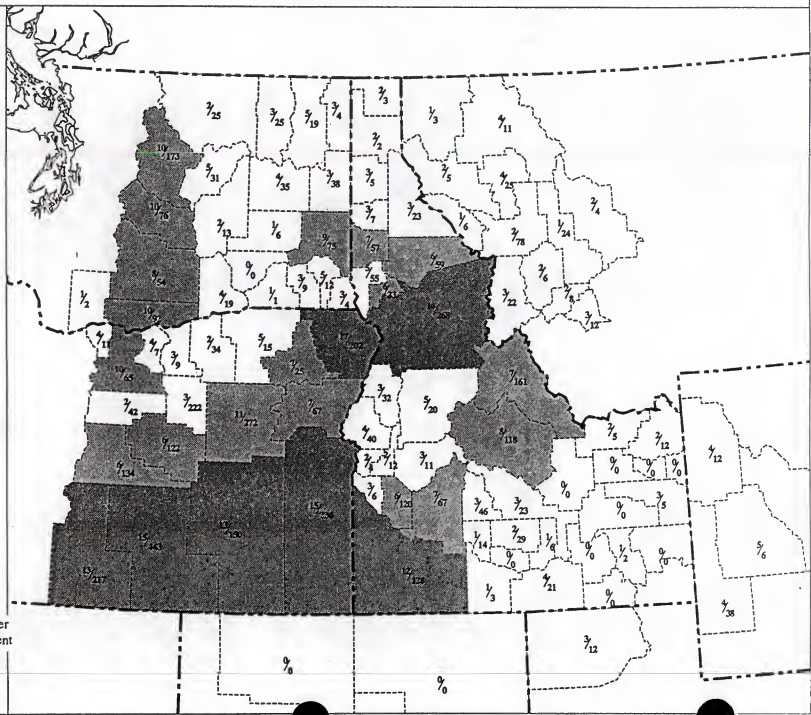


Figure 3. Map of the ICBEMP compiled from state Heritage Program data showing the number of taxa over the number of element occurrences found in the county.

ICBEMP

## Species Narratives

This information represents what was known about these taxa at the time the panels were conducted in 1994-1995. This information has not been updated to reflect the data collected in recent field seasons. The only updates have occurred for those species listed as Threatened or Endangered. Though dated, this information represents a starting point for analysis for these taxa across their range.

*Abronia ammophilla* Greene is a local endemic found only on sand dunes and beaches around Yellowstone Lake, all in Yellowstone National Park, Wyoming. This species is unique because it occurs at elevations higher than other members of its genus (7,700 feet). Road building and trampling (mostly by humans) seem to have affected the greatest impacts to this species, causing the extirpation of at least one site. The population is estimated to be no more than 1,000 individuals. Demographic uncertainty related to a highly restricted distribution and small population size is also a significant threat to this species. *A. ammophilla* is currently in decline.

*Agrostis rossiae* Vasey is a locally endemic annual grass found exclusively on hydrothermally warmed siliceous sinter in the Yellowstone, Wyoming region. It occurs at elevations between 7,250 and 7,400 feet. There are three primary occurrences in Yellowstone National Park divided into numerous local colonies. These colonies may fluctuate in size reflecting changes in thermal intensity and may become locally extirpated. This species is an important source of winter forage for wildlife, especially native ungulates. It is currently threatened by the invasion of exotic plant species and the development of thermal resources adjacent to Yellowstone National Park.

*Allium aaseae* Ownbey is a local endemic restricted to Glens Ferry sands between the Boise Front and Weiser, Idaho. The majority of *A. aaseae* populations are found in a narrow elevational band between 2,100 and 2,800 feet. This species prefers southerly aspects and may be found on sites with slopes of 15-80%. Typical *A. aaseae* sites have very low (<20%) vegetative cover. This species flowers in the very early spring and is thought to contribute significantly to the support of a diverse spring insect fauna. The primary threats to this species include land development, sand mining, and exotic plant species. Timber harvest, road building, and off-road vehicles (especially motorcycles) are also seen as significant threats to some populations. This onion is sensitive to any disturbance that disrupts the soil profile as it appears to require the coarse, sandy substrate, overlaying a clay layer. This species is frequently associated with two other rare taxa, *Astragalus mufordiae* and *Lepidium papilliferum*. The threats from livestock grazing have been decreasing over recent years. Dr. D. McNeal of the University of the Pacific recently completed a taxonomic treatment of *A. aaseae* (McNeal 1993) and Dr. J. Smith of Boise State University is currently engaged in DNA research concerning the origins and evolution of *A. aaseae*. The Boise District BLM botanist (A. DeBolt) located several large populations of this species in the spring of 1995.

*Allium dictuon* St John is a local endemic, known from four occurrences, in a one to two square mile area to the north and west of Weller Butte, on the Umatilla National Forest in Columbia

County, Washington. Sites range from 4,900 and 5,200 feet in elevation, on open, sparsely vegetated, shallow soils along the lower margins of basalt outcrops in weathered basalt scablands among *Festuca idahoensis* and *Poa sandbergii*. *Pinus ponderosa* in mixed stands of *Pseudotsuga menziesii* occurs at the margins. This bulb forming species tolerates fire and in general, its habitat doesn't burn intensely because of low fuel loading. Thus, around Weller Butte, scablands are often chosen for fire line location during fire suppression activities. Being very geographically restricted, *Allium dictyon* could be threatened by this kind of ground disturbance. Mc Neal (1995) speculates that solitary and social bees (*Apis mellifera*) and other insects may be responsible for pollination. Overall, little is known about the biology of this species. More species-specific survey and monitoring work is needed to assess the viability of this species.

*Amsinckia carinata* Nels. & Macbr. is a local endemic known from six occurrences in northern Malheur Co., Oregon, covering a total area of less than 15 acres, with a majority of the populations on federal land. A facultatively autogamous annual, *A. carinata* occurs in xeric, relatively barren sites. Substrates derived from ash and welded tuffs are high in sodium, yellow to reddish in color, and gravelly to cobbly in texture. Soil development is poor, and harsh substrate conditions result in low vegetative cover. *Amsinckia tessellata* and *Atriplex spinosa* are nearby associates. Grazing is currently the most serious threat to the species. Cattle trails occur throughout the populations and grazing has enabled exotics, including Russian thistle (*Salsola kali*) and cheatgrass (*Bromus tectorum*), to invade sites that might otherwise support *A. carinata*. Off-road vehicle (ORV) traffic is also a potential threat and is heavy at some sites. Many areas have been closed to ORV traffic, and a BLM Conservation Agreement has been signed with the USFWS. Population trends for the species are unknown.

*Antennaria arcuata* Cronquist is a scattered endemic found in scattered locations in Idaho, Nevada, and Wyoming though it is nowhere common. It is found at elevations between 4,950 and 8,000 feet on bare calcareous, alluvial soils. *A. arcuata* appears to be able to take advantage of periodic small disturbances for regeneration sites, though heavy disturbance is not well tolerated. The introduction of exotic species and activities that alter the hydrology (especially the water table) of its mountain meadow habitats are the greatest threats to the viability of *A. arcuata* populations. Land development and herbicide spray and drift are seen as significant but less immediate threats. Other identified threats to this species include trampling and haying. There is disagreement as to whether livestock grazing is a threat or not. Sexual reproduction is not known in this species. A DNA analysis of Idaho and Nevada populations (Bayer 1992) found that most of the genetic variation in this species is found within rather than among populations.

*Antennaria aromatica* Evert is a scattered endemic species. It is found in portions of the Rocky Mountains from Colorado, Montana, and Wyoming, and one occurrence in the Wallowa Mountains of Wallowa County, Oregon. Here this species is found on Martin-Bridge limestone formations between 8,000 and 10,100 feet in elevation. This plant displays a distinguishing citronella-like odor (Evert 1984). It is often found with *Trisetum spicatum* on alpine scree, bare limestone ridgetops, cirque basins, alpine turf and xeric upper slopes. Though scattered across several states, it is not abundant at any location (Evert 1984). As an alpine species, it could be

threatened by global warming, as its refugia would be limited. If populations of mountain goats in the Wallowa Mountains increase dramatically their foraging could impact *Antennaria aromatica*.

*Arabis falcifructa* Rollins is a regional endemic known from two drainage systems in northeastern Nevada, Northwestern Utah, and adjacent Idaho. Its preferred habitat correlates are north aspect slopes between 5,300 and 6,500 feet on soils with a high cover of cryptobiotic crust (>60%). *A. falcifructa* occurs on soils dominated by either sand or silt that usually have a significant fraction of volcanic ash or (in Utah) on metamorphic and quartzite rock outcrops. Livestock grazing and the invasion of exotic plant species are the greatest threats to populations of this rare mustard. Fire suppression, highway and road maintenance, and mining are also important threats to the continued viability of this species. The trend of this species is unknown throughout its range.

*Arabis fecunda* Rollins is a regional endemic, restricted to three counties in southwest Montana (Deerlodge, Ravalli, and Silver Bow counties). It is currently known from 20 occurrences within this geographic area, and occurs in or adjacent to the Highland, Pioneer, and Sapphire mountain ranges. The species is edaphically restricted as well, being wholly confined to alkaline soils derived from calcareous bedrock (typically limestone) that has been metamorphosed by batholithic intrusions (Lesica 1993a). These outcrops typically support sparse vegetation, which includes *Cercocarpus ledifolius* shrub stands, as well as other azonal stands of various bunchgrasses and perennial forbs. Known occurrences range from 4000 to 8000 feet elevation. Invasion of the habitat by exotic plants, especially *Centaurea maculosa* (spotted knapweed), is a serious threat to the populations in Ravalli County, and reduces recruitment rates (Lesica and Shelly 1990). The species is also frequently associated with cryptogamic crusts, and older, established plants show increased survival where intact crusts are present (Lesica and Shelly 1992). Enzyme electrophoretic studies of plants from five populations revealed a very small amount of interpopulation genetic variation; all plants sampled were monomorphic for 11 of 12 proteins. These data suggest that the species is highly inbred (Leeper et al. 1992). However, there is great variation in demographic and life history traits among populations; the variation in life history strategies is achieved through different proportions of plants that are iteroparous (repeatedly reproductive) or semelparous (having a single reproductive bout followed by death) (Lesica and Shelly 1995). Four years of intensive demographic monitoring at three sites has revealed that *A. fecunda* is a short-lived perennial with significant variation in recruitment rate, survivorship, age at maturity and fecundity among sites. Populations in the southern portion of the range appear to be stable, and will be most sensitive to changes that cause a reduction in recruitment, while northern populations may be declining and should be most sensitive to declines in adult survivorship (Lesica and Shelly 1994). Walsh (1992) found that the characters that most influenced survival and reproduction were size of the basal rosette (positive effect) and bolting (negative effect). A rangewide conservation strategy is needed for this species.

*Arabis suffrutescens* Wats. var. *horizontalis* (Greene) Roll. is a local endemic, known from six occurrences in the southern East Cascades province, Klamath Co., Oregon, with fewer than fifty individuals in each. It is found in the alpine zone of Crater Lake National Park at sites above 6500 feet. The perennial cruciferae is located on steep, barren slopes on light-colored,

coarse-textured pumice soils. Associated species include *Arabis platycaule*, *Carex breweri*, *Erigeron peregrinus* and *Raillardella argentea*. Surrounding forested sites include *Pinus albicaulis*. Some trampling occurs by recreational hikers at Crater Lake caldera and Mt. Scott. Population trends are currently considered stable.

*Artemisia campestris* L. ssp. *borealis* Hall & Clem. var. *wormskioldii* (Bess.) Cronq. is a regional endemic known from the Columbia River Gorge. There are two occurrences in Klickitat County, Washington with one on federal land and although once known from two locations in Sherman County, Oregon, these are extirpated. The plant is restricted to a 300 ft. shoreline corridor along the river and range from 300 to 500 ft. in elevation. At one site several plants grow on a compacted river cobble terrace degraded from recreation users. There are scattered low shrubs with at least 50% bare ground. At the other sit, plants grow from crevices in basalt outcrops with less than 100 plants spread over a 30 by 100 ft. area. This biennial or perennial plant is susceptible to damage from raising the Priest Rapids Reservoir. Populations are small and isolated, which leads to the fragmentation of taxa. Historic sites are underwater in reservoirs. Significant threats include raising water levels of dams, ORVs, orchard development, and exotic plants.

*Artemisia ludoviciana* Nutt. ssp. *estesii* Chamb. is a local endemic of the Deschutes River, Oregon. A clonal perennial shrub, it grows immediately adjacent to the river on coarse, gravelly banks and exposed bedrock soils of *Salix*-dominated floodplains. Habitat is inundated during winter and early spring months, but is generally dry by summer. Thirteen occurrences are reported from three counties (Crook, Deschutes, Jefferson), with sites ranging from the Little Deschutes River near La Pine (Deschutes NF), to the Deschutes River, and from Benham Falls downstream to Lake Billy Chinook. Habitat is primarily on private land, but approximately fifty percent of sightings have been on BLM land. One population occurs on state land at Cline Falls. Pollination in *A. ludoviciana* ssp. '*estesii*' is anemophilous. Seeds mature in late summer and are dispersed primarily by water, and secondarily by wind. The species' occurrence along perennial riverine habitats makes it locally important as an anchor to stabilize stream banks and provide limited shade. Trampling by cattle and recreationists, and changes in hydrologic regime, especially a lowering of the water table, are considered threats. Potential displacement by exotic species is also a threat. Population trends are currently considered stable.

*Aster jessicae* Piper is a regional endemic currently restricted to tiny remnants of its former range in the Palouse of the Idaho panhandle, where most populations occur on private lands, and in adjacent southeastern Washington. In Washington, there are nine occurrences in Whitman County, all on private land. The populations are small in size and area. In northern Idaho, *A. jessicae* is restricted to silty loam soils or deep loess soils, where it may act as a soil stabilizer and occurs with other rare Palouse endemics such as *Haplopappus lairiformis* and *Silene spaldingii*. This species depends of periodic fires to maintain its habitat; however, such events are rare today. The greatest threats to *A. jessicae* stem directly from agricultural activities. In the past century, approximately 98% of *A. jessicae* populations and habitat have been lost to agricultural conversion. This species was once found primarily in *Festuca idahoensis* and *Symphoricarpos albus* plant communities with roughly 95% cover. Today, remnant populations are found with a variety of introduced and annual grasses and forbs and continue to be lost to

housing developments and continuing agricultural conversion, though habitat management of relict populations may need to be complimented by restoration, as many of the sites have several exotic species. All populations occur in remnant habitats, especially eyebrows, the area between roads and fences, railroad right-of-ways, roadsides, and creeksides. Other ongoing threats include the elimination of the natural fire regime, livestock grazing, herbicide spray and drift, and the invasion of exotic species. The most recent status report on this species was done in 1991 (Lorain 1991a).

*Aster mollis* Rydberg is a regional endemic known primarily from the Bighorn Mountains, Wyoming with a single disjunct population within the assessment area (south of Yellowstone National Park) in Hoback Canyon that has not been relocated since 1922. It occurs in mountain meadows, forest edges, sagebrush grasslands, and open aspen stands. It prefers mesic sites on deep, alkaline or limestone derived soils. *A. mollis* could serve as a sensitive indicator species of good (or better) range conditions. Threats to this species are infrequent with the exception of livestock grazing which impacts populations directly by consumption and trampling and indirectly by facilitating the introduction of exotic plant species. Road construction associated with timber sales has been documented as a localized threat.

*Astragalus anserinus* Atwood, Goodrich, & Welsh is a regional endemic found on the tuffaceous ashes of the Goose Creek drainage of southern Idaho, Northwestern Utah, and northeastern Nevada at elevations between 4,500 and 6,000 feet. This nitrogen fixing species prefers sites with a southerly aspect and cover values of less than 20% (usually dominated by mountain big sage and juniper). Threats to this species stem largely from livestock grazing and the invasion of exotic plant species though fire suppression activities, mining, road maintenance, and herbicide spray drift are also seen as important challenges to local viability. The current trend for this species is downward.

*Astragalus applegatei* Peck is a federally listed endangered species. It is a local endemic known historically from seven populations, two of which are extant in Klamath Co., Oregon, near Klamath Falls. The species is limited to two narrow areas of occurrence within the southern portion of the East Cascades physiographic province, comprising a metapopulation of fewer than 20,000 individuals spread over a total area of less than ten acres. Of the two populations, one is on state land, but the largest occurs on private land leased by the Nature Conservancy. The species is a long-lived, deeply taprooted legume found in flat, open, seasonally moist remnants of floodplains characterized by *Poa nevadensis*-*Puccinella lemmonii* grasslands and salt desert shrub flats of the Klamath Basin. Sites range in elevation from 4000 to 4200 feet. *A. applegatei* is associated with *Sarcobatus*, *Distichlis*, and *Castilleja* species. Seasonal flooding at these sites may limit the dominance of other species and create favorable openings, and it is thought that historic drawdown of the water table may have eliminated some sites. Historically, agriculture conversion in the Klamath Valley was a major factor in the reduction of habitat. Today both agriculture and urban development may still impact small undetected relict sites on private land. Habitat conversion at the site of the principal population to exotic species, including quackgrass, cheatgrass, and *Melilotus* appears to be a significant cause of population decline. *A. applegatei* hosts an unknown species of beetle larvae and the adult stage of a number of genera of blue butterflies (Family Lycaenidae). Ground disturbance poses threats to pollinators, notably

ground-nesting bees. With the loss of pollinators, gene flow and seed set are inhibited, and loss of fruits to predators may also result in significant losses. The endangerment of *A. applegatei* is considered very high and it is considered one of the most imperiled plants in Oregon as populations are on a decreasing trend.

*Astragalus atratus* Wats. var. *inseptus* Barneby is a local endemic native to the shallow basalt soils of the northern Snake River Plains in southern Idaho between Blaine and Elmore Counties. Populations of this nitrogen fixing forb are usually found between 2,900 and 5,600 feet in cool, clay rich soils. Vegetative cover of typical *A. atratus inseptus* sites range between 10-40%. This species is in decline as a result of several serious threats, most prominent being road building, land conversion, livestock grazing (especially trampling), the change in historic fire regimes, and the invasion of exotic plant species. Less immediate but still important threats stem from range improvements (especially seeding) and the use of herbicides. A 1991 (Smithman) status survey is available for this species.

*Astragalus collinus* var. *laurentii* Barneby is a local endemic in Oregon. In the Columbia River Basin Province, there are 31 locations in Gilliam, Morrow, Sherman and Umatilla Counties. All populations are fragmented, relictual occurrences mostly on road shoulders. None are in federal ownership. It occurs on fractured basaltic outcroppings from 1970 to 2700 ft. in elevation. Significant threats are exotic plants and development. Two populations have been destroyed in the city of Pendleton since 1972. It is a nitrogen fixer and contributes to soil stabilization.

*Astragalus columbianus* Barneby is a local endemic of south-central Washington. In the Columbia River Basin Province, it occurs in Yakima, Cadets and Benton Counties. Of the 32 occurrences, 24 are on federal land. Populations of this perennial usually consist of several hundred plants. This nitrogen fixer, is only found along the banks and hills of the Columbia River on compacted river cobble, loam, sandy loam, and basalt scablands with shallow basic soil. The plant ranges from 420 to 2500 ft. in elevation in big *Artemisia tridentata* and *A. rigida* plant communities where rainfall is 7 to 12 in. per year. Although very limited in range, populations may be large with hundreds of plants, even in disturbed areas. It shows an initial positive response to fire, but decreases in number as the cover of big sagebrush increases. Palatable to sheep and cows, grazing is a significant threat. This plant produces large fruit, which may provide food for other mammals also. Additional threats include military exercises and developments for orchards and recreation.

*Astragalus diaphanus* Dougl. ex Hook. var. *diurnus* (Wats.) Barn. is a regional edaphic endemic of the South Fork of the John Day and Columbia Rivers in Klickitat County Washington and Grant County, Oregon. There are no extant sites in Washington. This nitrogen fixing, annual species grows in *Juniperus occidentalis* woodland openings (<5% cover) with *Cercocarpus*, *Lewisia*, and *Eriogonum* species on thin well drained volcanic substrates suspected to be naturally low in available nitrogen. Site elevations range from 1,650 to 4,000 feet. Adequate winter and spring precipitation is required for seed production and germination. It has been removed from the Oregon Sensitive List because of its abundance and apparent positive response to perturbations as disturbance of seedbeds by animal trails and rill erosion is needed.

It is found on sandy soils derived from John Day volcanic ash. It provides soil stabilization for highly eroded soils. A change in fire regime is a significant threat. Pollination is by small bees or autogamy. Mature fruits are dispersed by wind, gravity, and overland water flow. Predation on fruits and minor herbivory by small mammals and insects also occurs.

*Astragalus diaphanus* var. *diurnus* sites overlay a significant source of cinders used in the maintenance of nearby roads, and a primary threat to this species is the potential excavation and subsequent invasion of these sites by exotic species. Changes in the historic fire regime and off-road vehicle use threaten this species.

*Astragalus howellii* Gray is a local endemic of the lower Deschutes River watershed. It has a relatively broad ecological amplitude, occurring on sites ranging from lower and upper slopes, to ridges, on shallow gravelly lithosols. Ten occurrences are reported from the southern East Cascades and High Lava Plains provinces, Wasco Co., Oregon. Associated communities include, but are not limited to, *Pinus ponderosa* and *Quercus garryana* forested communities and *Artemisia tridentata*-*Agropyron spicatum* communities. The species is known to populate road banks and disturbed substrates, and its invasive habit contributes to a locally common distribution. *Astragalus howellii* habitats are often grazed, and the species itself is palatable to livestock. However, grazing does not appear to significantly impact species viability, and population trends are considered stable. Due to its pioneering characteristics, this species may flourish following wild or prescribed fires.

*Astragalus mulfordiae* M.E. Jones is a regional endemic restricted to course, deep, and usually sandy soils in southwestern Idaho and adjacent Oregon (primarily the Glens Ferry sands and related formations). Vegetative cover at typical *A. mulfordiae* sites is usually low (less than 20%) and is often dominated by bitterbrush (*Purshia tridentata*) with an occasional significant component of *Stipa comata*. Other common associates include *Balsamorhiza sagittata*, *Chrysothamnus viscidiflorus*, *Oryzopsis hymenoides* and *Penstemon acuminatus*. *A. mulfordiae* is found only on sites with a minimal slope of 10%. Populations being monitored in Idaho and Oregon both show distinct population declines in recent years (90% in some areas). Major threats to the viability of *A. mulfordiae* populations include mining, land development, changes in the historic fire regime, range seedings (especially with crested wheatgrass), and the invasion of exotic plant species. Livestock grazing and road building are problems in certain areas. One population has declined by over 90 percent within the last six years as a result of sheep and cattle grazing, and small mammal herbivory. Smithman (1993) completed a field survey of the eastern edge of this species range in Idaho and a conservation agreement for this species exists between the US Fish and Wildlife Service and the BLM. Owen, et al. (1994) found that all (or most) populations of *A. mulfordiae* are infected with a rust. The pathological impact of this fungus is unknown.

*Astragalus oniciformis* Barneby is a regional endemic restricted to shady soils north of the Snake River between Picabo and Craters of the Moon National Monument in southern Idaho. It is immediately threatened by land development, road building, and the invasion of exotic species. Livestock grazing and the historic change in fire regimes are also threats. Current population levels of *A. oniciformis* are projected to be decreasing.

*Astragalus paysonii* (Rydb.) Barneby is a regional endemic restricted to three eastern Idaho counties and western Wyoming. *A. paysonii* is found in early seral forests (especially lodgepole pine) at moderate elevations (4,000 to 9,600 feet). It seems to tolerate moderate levels of disturbance (consistent with its early seral habit), prefers sites with low relief, and grows best on well drained soils where canopy closure is between 15-45%. The factors that determine this species' distribution are poorly understood and there appears to be much unoccupied suitable habitat. Some authors have suggested that the species may be short lived and restricted to early successional environments (Fertig pers comm). In Wyoming, 15 of the 34 known occurrences are found within the ICBEMP assessment boundary, where the mean population size is 225 plants and all sites are on federal land. Data from Lorain (1990) for Idaho suggests an even smaller total population in Idaho. The greatest threats to the viability of *A. paysonii* populations include changes in the native fire regime and resultant alteration of in the historic distribution and size of forest structural stage patches. The invasion of exotic plant species and road building are also considered to be important threats to this species viability. A limited survey report for this species was completed in 1990 (Lorain).

*Astragalus peckii* Piper is a regional endemic known from a total of thirty-eight occurrences reported from Klamath and Deschutes Counties, Oregon. In 1995 several new occurrence were discovered on the Chiloquin Ranger District of the Winema National Forest. The species is found on nearly level sites characterized by deep, dry, loose Mazama pumice or ash soils at elevations between 3,000 and 5,000 feet. *Astragalus peckii* is an early seral, perennial legume that occupies open, sunny sites in the coniferous or shrub canopy. Habitat is characterized primarily by *Juniperus occidentalis*/Purshia tridentata/bunchgrass, *Pinus ponderosa*, and *Artemisia tridentata* communities. It is also found in association with topographic climax *Pinus contorta* stands with *Purshia tridentata* understory. Its flowers appear to be pollinated by small bees, and seeds are dispersed by gravity and wind. As with other members of the genus, *A. peckii* fixes atmospheric nitrogen, although its contribution to the nitrogen budget in a *Purshia tridentata* community may be minimal. Populations of high density are known from recently disturbed habitats, and populations are stable to decreasing in trend. Threats to habitat are primarily associated with urbanization in central Oregon. Silviculture and fuels prescriptions to decrease canopy cover and diminish fuel loads while protecting the soil and seed bank could benefit the species.

*Astragalus pulsiferae* Gray var. *suksdorfii* (Howell) Barneby is a disjunct perennial species in Washington with the rest of its range in the Sierra Nevada and Cascade Mountains of California. In the East Cascades North Province, it is known from three occurrences in Klickitat County, two of which are on federal land. Populations range from 35 to 600 plants and are found on volcanic soils. Its habitat includes, *Pinus ponderosa* woodlands on flat areas of sand and gravel, as well as disturbed roadsides and old roadbeds. Significant threats to this nitrogen fixer include changes in fire regimes, the invasion of exotic plants, and timber harvest.

*Astragalus scaphoides* (Jones) Rydb. is a regional endemic restricted to talus slopes derived from Challis volcanics. This nitrogen fixing species is immediately threatened by livestock grazing, changes in the historic fire regimes, land development, and the invasion of exotic plant species. Current populations are projected to be stable.

***Astragalus sinuatus* Piper** is a local endemic to southern Chelan County, Washington. The plant is known from nine occurrences in the East Cascades North Province. Five of these are on private land. Populations of this perennial may include several hundred plants scattered over tens of acres. It inhabits light porous, well-drained and relatively deep loam and basalt soils on southeastern to southwestern aspects on lower slopes, toe slopes, and mid-slopes. It ranges from 400 to 2000 ft. in elevation in the *Artemisia tridentata* and *Agropyron spicatum* plant community. Monitoring data for this nitrogen fixer shows that invasion by exotic plants is the major threat. Grazing has caused an increase in fuel for fires, where establishment after fire is poor for this species.

***Astragalus solitarius* Peck** is a regional endemic of the Great Basin and Owyhee Uplands physiographic provinces, and adjacent Nevada. It is known in Oregon from seventy-five occurrences in Harney and Malheur Cos., many of which have been recently reported. The species is found on flat to rolling topography within *Artemisia tridentata* and pristine *Artemisia tridentata* ssp. *wyomingensis*/*Agropyron spicatum* communities, and occasionally in association with *Purshia tridentata* or *Atriplex spinosa* communities. Individuals frequently establish near the crown of *Artemisia*, and where solitary, away from the protective environment of the nurse plant, individuals are stunted. Collectively, *A. solitarius* populations are considered stable, although most sites are degraded as a result of grazing. Fire and livestock are considered threats where they lead to a loss of the shrub component and to increased competition from exotics, especially cheatgrass and crested wheatgrass. Mining claims are present at many sites, and the potential impacts of mining on the species requires monitoring.

***Astragalus sterilis* Barneby (= *A. cusickii* var. *sterilis*)** is a regional endemic restricted to a variety of ash deposits in the northern Owyhee desert in Idaho into the Succor Creek and Leslie Gulch areas of adjacent Malheur County, Oregon. *A. sterilis* is found between 2,800 and 4,600 feet on steep slopes that are essentially devoid of vegetation. Populations are small, ranging from 11 to 50 individuals per site, and the species' entire range encompasses an area 30 by 15 miles. *Astragalus sterilis* is an early successional species, and while it colonizes newly exposed ash outcrops, it has not been found colonizing recently disturbed areas such as roadsides. This nitrogen fixing forb is subject to many threats, most significantly mining (especially zeolite and bentonite but also gold), the invasion of exotic plant species, and road building. Lesser yet still important threats stem from changes in the historic fire regime, livestock grazing (especially from trampling), land development (including seeding), and OHV's. A 1990 (Smithman) status survey is available for this species.

***Astragalus tegetarioides* M.E. Jones** is a regional endemic found in the Basin and Range and Blue Mountains physiographic provinces. It is known in Oregon from at least fifty occurrences in Harney Co., only one of which occurs within the Basin and Range Province. Many new populations have been located recently (A. Kratz & N. Taylor, pers. comm.). Populations are distributed from near U.S. Highway 395 west to the Dry Mountain area near Riley, at elevations between 4800 and 5220 feet. All known populations are under public ownership (Meinke & Kaye 1992), and most recent sightings have been from the Snow Mountain RD, Ochoco NF, and secondarily from the northern end of the Burns and Lakeview Districts, BLM. *Astragalus tegetarioides* develops a deep taproot capable of exploiting late-season moisture, and individuals

occupy cracks in tuffaceous and basalt outcrops, sites on poorly developed soils derived from pink welded tuffs, and occasionally on deeper soils in big sagebrush-dominated swales and in openings within ponderosa pine forest. Soils are generally shallow and stony, however, poorly to moderately drained, and comprised of ashy clays overlying heavily fissured bedrock (Meinke & Kaye 1992). Sage-scab flats supporting the species often interfinger up into ponderosa forest, and have likely been maintained historically by fire. The species has also been identified at a borrow pit on the Ochoco National Forest, and on abandoned skid roads, gravel roadbeds, and in roadside ditches. As the species is found on three diverse substrate types (bedrock, shallow gravelly soils, and deeper soils within swales), habitat relations and possible taxonomic differences require further attention. The species appears to be a poor competitor, and a thick litter layer or dense shrub overstory may inhibit its establishment. Within the ponderosa sites, associated species include *Artemisia arbuscula*, *A. tridentata*, *Purshia tridentata*, *Allium acuminatum*, *Calochortus macrocarpus*, *Ipomopsis aggregata*, *Mimulus nanus* and other annual forbs. Associated species at a disjunct rimrock-scrub site near Little Juniper Mountain include *Juniperus occidentalis*, *Artemisia rigida*, *A. arbuscula*, *Chrysothamnus nauseosus*, *C. viscidiflorus*, *Astragalus purshii*, *Lomatium nevadense*, *Lewisia rediviva*, *Agropyron spicatum*, and *Poa sandbergii*. The species appears to be insect pollinated, and habitat destruction leading to a reduction of ground-nesting pollinators could severely impact seed set. A monitoring study to assess impacts of timber harvest activities on *A. tegetarioides* was initiated on the Snow Mountain District, Ochoco NF, in 1991. Livestock grazing and invasion by exotics may also pose a threat. Future management of the species may require prescribed fire to maintain overstory openings in associated ponderosa pine communities.

*Astragalus tyghensis* Peck is a local endemic known from twenty-four occurrences in Tygh Valley in eastern Wasco Co., Oregon. It occurs on deep, well-drained soils of the Bakeoven-Watama and Bakeoven-Maupin soil series in *Artemisia tridentata*-*Agropyron spicatum* communities along the edge of *Pinus ponderosa*, *Quercus garryana*, and *Juniperus occidentalis* mixed forest. Habitat is characterized by a mounded prairie topography. A deeply-taprooted perennial legume, its flowers provide nectar and pollen to native bees. Exotic annual grasses, including *Bromus tectorum* and *Taeniatherum caput-medusae*, are common on some sites. Agricultural conversion of habitats has caused fragmentation of populations and concurrent reduction or loss of gene flow. Removal of encroaching vegetation by prescribed fire may prove beneficial. Early demographic studies by the Oregon Department of Agriculture suggest that populations are stable, but many additional years of data are required to confirm an increasing trend.

*Astragalus vexilliflexus* Sheld. var. *nubilus* Barneby is a local endemic known only from the White Cloud Peaks of Custer County, Idaho. It occurs on ridgecrests and upper slopes to an approximate elevation of 9,000 feet. Fewer than ten populations of this low-growing *Astragalus* are known though there is much unsurveyed habitat on the east side of the White Clouds. Current threats have been documented from recreation (especially off-road vehicle use on trails), mining, and grazing (though the impact of grazing is variable among sites). A survey report for this species was compiled in 1990 (Mancuso and Moseley) and a related report concerning *A. vexilliflexus* was prepared in 1994 (Moseley).

*Astragalus yoder-williamsii* Barneby is a regional endemic found in southwestern Idaho and adjacent Nevada at elevations between 4,560 and 6,000 feet on shallow to moderately deep, cool soils. This sparsely distributed, nitrogen fixing forb is threatened by historic changes in the native fire regime, road construction, mining, grazing (as a result of trampling), and range improvements (especially seeding, water developments, and juniper burning). The introduction of exotic species has threatened *A. yoder-williamsii* more by increasing fire frequency than through obvious direct competition. A recent status survey for this species is available (Mancuso and Moseley 1993a).

*Balsamorhiza rosea* Nels. & Macbr. is a local endemic in southern Washington and adjacent Oregon. In the Washington portion of the Columbia River Basin Province, this species is more abundant than previously thought. The single occurrence in Umatilla County, Oregon has been extirpated. It grows on fractured basaltic crevices, rocky ridgecrests, and butte summits from 1000 to 3500 ft. in elevation. Important threats include development of television, wind turbine and microwave tower sites; mining, and exotic weed invasion.

*Botrychium ascendens* W.H. Wagner has a scattered distribution within its' geographic range of Alberta, British Columbia, Ontario and Yukon in Canada, and Alaska, California, Montana, Nevada, Oregon and Wyoming in the United States. It is rare throughout its range (Wagner and Wagner 1986, 1993). In Idaho, this species has been found in and near riparian areas within late seral, moist forests (western red-cedar with grand fir) that have greater than three inches of accumulated duff; this species is often found with other *Botrychium* species, especially *B. manganense*. In the Okanogan Highlands Province, this short-lived perennial is only known from one confirmed location, which is on National Forest Service land. This site in Ferry County is on the moist floodplain of a perennial stream in a late seral *Thuja plicata* and *Clintonia uniflora* forest. Canopy cover is 100% with a cedar duff layer. Elevation ranges from 3980 to 4120 ft. Three other species of *Botrychiums* occur with it, forming a "genus community." Sightings should be verified for correct identification, as this species is easily confused with others. *Botrychium ascendens* is currently verified from only one location in Montana, this based on a specimen collected by C.L. Hitchcock in 1948. This collection was made near the Chinese Wall, in the Bob Marshall Wilderness Area in northwest Montana. Another population may be located in the Little Belt Mountains of central Montana, but its identification has not been verified (W. Phillips, pers. comm.). Mycorrhizal fungi are required for spore germination and gametophyte development of *Botrychiums*. The major threats to *Botrychiums* in general are timber harvest (due to overstory removal), riparian disturbances, stand replacement fires.

*Botrychium crenulatum* Wagner is a species of scattered geographic distribution in the western United States, known to occur sporadically in the states of Arizona, California, Idaho, Montana, Oregon, Nevada, Utah, Washington and Wyoming (Flora of North America Association 1993). It is currently known from one verified occurrence in Montana, that having been last observed in 1984 in Lake County (Montana Natural Heritage Program database records, Helena), and three likely occurrences on the Kootenai National Forest in Lincoln County (L. Ferguson, pers. comm.). The species occurs in moist forests at lower elevations, typically in association with mature or old growth *Thuja plicata* (western red cedar) groves; the Lake County record was found at an elevation of 3,100 feet (Lesica and Shelly 1991). It is also described as occurring in

"marshy and springy areas" (Flora of North America Association 1993). One of the Lincoln County populations was found in a highly disturbed roadside ditch, but this ditch does not have noxious weeds present, and is moist for most of the year (L. Ferguson, pers. comm.).

In the Okanogan Highlands Province, it occurs in 42 sites in Okanogan, Ferry, Stevens and Pend Oreille Counties, all on National Forest Service land. Although a few sites have over 100 plants, most populations have under 20. This species grows in moist areas, such as moist meadows, perennial or intermittent streams, and seeps in mid- to late seral forests of *Thuja plicata*, *Tsuga heterophylla* and *Picea engelmannii* with over 70% canopy cover. Sites range from 2030-5200 ft. in elevation and are on floodplains, in draws, ravines, and on lower slopes. It often occurs in "genus communities" with other species of *Botrychium*.

In the East Cascades province of Washington, these short-lived perennial plants occur in moist openings and seeps, as well as near intermittent and perennial streams in *Thuja plicata* and *Tsuga heterophylla* forests over 100 years of age. Habitat characteristics include high organic matter, mafic soils with a high soil moisture, and a needle duff layer from 2 to 6 in. deep. Landforms encompass floodplains, draws, basins and midslopes from 3000 to 5500 ft. in elevation with over 20% canopy cover on northerly slopes of five to 30%. There are six occurrences that mostly consist of small (less than 50 individuals) populations.

In the Blue Mountain Province this *Botrychium* was known from eight occurrences in Union and Wallawa counties of Oregon. Recently, a single plant occurrence was confirmed from Grant County Oregon (Urban 1995), and an additional 15 occurrences have been reported from Crook and Harney Counties, in Oregon (Streier 1995). It is frequently misidentified, leading to occasional unverified reports in other areas (Zika 1992). In the Blue Mountain Province it has been reported growing in partially shady habitat between 4,800 and 6,000 feet in elevation. It is affiliated with year-round mesic, and semi permanently flooded marshy meadows and openings adjacent to Englemann's spruce, lodgepole pine, or grand fir stands. The soils at known sites are influenced by Quaternary surficial deposits or Hurwall Formation (Zika 1992) sedimentary, bedrock.

This species can be found in the same forest types as *B. ascendens* but usually prefers wetter, more mesic, sites. As with many *Botrychium* species, focused field surveys are needed in order to better understand the distribution, abundance and habitat relationships of *B. crenulatum*. Known threats derive from activities that alter canopy closure or drain its habitat (i.e., timber harvests and some livestock grazing activities) as this species is sensitive to changes in soil moisture levels. Other significant threats include fires that remove the canopy cover and change species composition, trampling from grazing, timber harvest (clearcuts), and road construction. *B. crenulatum* may tolerate low intensity fire if burning happens after sporulation in late summer or early fall; spring and summer burning is adverse. Although apparently tolerant of some ground disturbance, the level of such disturbance has not been quantified. It is threatened at many known locations by excessive trampling by campers and recreational livestock grazing.

*Botrychium lunaria* (L.) Swartz is a peripheral species in Washington, but is the most widespread of the moonworts ranging from Alaska over most of Canada to the northeastern and western U. S. In the Okanogan Highlands Province, it is known from 14 occurrences in Okanogan, Ferry and Stevens Counties. Most are on federal or state land with less than 10 plants at a site. It ranges in elevation from 3000 to 7400 ft. This species grows in late seral forests of *Thuja plicata* and *Tsuga heterophylla* with over 70% canopy cover in moist areas on floodplains, lower slopes, and midslopes on well-developed duff layers. In Okanogan County, it occurs in subalpine meadows with 0 to 30% canopy cover often on deer or sheep dung, in grassy openings, or near perennial streams. It often occurs in "genus communities" with other species of *Botrychiums*. Stand replacement fires and clearcutting are the biggest threats.

*Botrychium paradoxum* Wagner is a rare species of scattered geographic distribution, with occurrences known in Alberta, British Columbia and Saskatchewan in Canada, and Montana and Utah in the United States (Flora of North America Association 1993) but more sparsely distributed than *B. crenulatum*. In the Okanogan Highlands Province, there are four sightings in Ferry and Stevens Counties, each has fewer than 10 individuals and all are on National Forest Service land. This short-lived perennial inhabits late seral *Thuja plicata* forests on floodplains, stream terraces near perennial and intermittent streams, lower and midslopes, and compacted old roadbeds. It also is found in early seral *Pinus contorta* plant associations in moist grazed old homestead meadows. It ranges in elevation from 2480 to 3520 ft. and occurs in areas disturbed by campers and cattle.

Seven occurrences have been documented in Montana (Vanderhorst 1993), from Deer Lodge, Glacier, Granite and Pondera counties (Lesica and Shelly 1991; Vanderhorst 1993). One population was not relocated, despite surveys in 1986. In most of these locations *B. paradoxum* is found in "genus communities" (mixed populations that include other species of *Botrychium*; Wagner and Wagner 1983). Habitats include mesic grasslands, meadows adjacent to lakes, and openings in forests dominated by herbaceous species. The largest population documented rangewide, on the Deerlodge National Forest, occurs in near-pristine native montane *Festuca scabrella* grassland. Another site on the Deerlodge National Forest is highly disturbed by rodents and big game; this habitat supports many fewer, typically small and chlorotic, plants. A third location is threatened by off-road vehicle use, recreational impacts and, possibly, a mining claim (Vanderhorst 1993). Many members of the Ophioglossaceae, including species of *Botrychium*, have no root hairs and are considered to be dependent upon associated endophytic fungi for mineral absorption as well as, presumably, carbohydrate nutrition (Gifford and Foster 1989; Lellinger 1985; Wagner and Wagner 1981). This mycorrhizal relationship, found in both the subterranean gametophyte and the terrestrial sporophyte, is apparently responsible for allowing the evolution of partially achlorophyllous species such as *B. paradoxum* (Wagner and Wagner 1981). The species of symbiotic fungi are not known. Because of this obligatory symbiosis, which is poorly understood, species of *Botrychium* cannot be propagated and studied apart from the wild (Vanderhorst 1993).

In the Blue Mountain Province this species was known from two occurrences in the Willowa Mountains of Willowa County Oregon. A single plant occurrence was recently confirmed for Grant County Oregon (Urban 1995). In the Blue Mountain Province it grows between 5,000 and

5,500 feet in elevation, on soils influenced by Quaternary surficial deposits or Hurwall Formation sedimentary, (limy) bedrock (Zika 1992). It is most often associated with open mesic meadows of Tufted Hairgrass-sedge assemblages and alluvial fans. Sites in the Lostine and Hurricane drainages of the Wallowa Mountains are in full sun with partial afternoon shade (Zika 1992). Other occurrences in Washington and Oregon have not yet been confirmed, thus it remains one of the rarest botrychiums in this genus (Zika 1992).

Focused field surveys, especially in geographic areas adjacent to known populations, are needed for this, and many other, rare species of *Botrychiums*. The plants are often difficult to detect, given that they usually occur in the dense understory of the associated herbaceous vegetation. *B. paradoxum* may tolerate fire if low intensity burning occurs after sporulation in late summer or early fall; spring and summer burning is detrimental, though no monitoring has been conducted. Populations in the Wallowa mountains are at risk from hiker trampling and camping. Recreational packstock also pose a threat via grazing and trampling impacts.

*Botrychium pedunculosum* W.H. Wagner is a species with a scattered distribution in Washington and Oregon. It is also found in a handful of locations in Alberta, British Columbia, and Saskatchewan. In the Okanogan Highlands Province, it is known from seven occurrences in Stevens and Pend Oreille Counties, all on National Forest land. There is also an herbarium collection from Ferry County, Washington. The type location is from the Lostine River, Wallowa County, Wallowa-Whitman National Forest, and from the literature from Union County, Oregon. In Washington, most populations are under 40 individuals, although one meadow site has over 1,000 plants. It grows in late seral *Thuja plicata* forests on lower slopes and in early seral *Pinus contorta* plant associations on the drier edge of grassy swales and moist grazed old homestead meadows. It is known from 2460 to 3350 ft. in elevation. It often occurs in "genus communities" with other species of *Botrychiums*. Exotic plants are a significant threat.

*Botrychium pumicola* Cov. is a local endemic that occupies alpine pumice barrens of the SE Cascade Range and coniferous forests of the southern pumice plateau. One hundred thirteen occurrences are reported from three Oregon counties (Deschutes, Klamath, Lake), ninety-three of which are from the East Cascades South, and twenty from the High Lava Plains physiographic provinces. Alpine populations are found on broad ridge tops ranging in elevation from 6500 to 8500 feet, while pumice plateau populations are generally found on planar or concave topographic surfaces between 4200 and 5150 feet. Sites are characterized by a *Pinus contorta*, *Purshia tridentata* and *Festuca idahoensis* or *Stipa occidentalis* community. *Pinus ponderosa* dominates some sites. Overstory canopy cover is relatively low, ranging from zero to 30 percent, with light shrub cover and only a trace of herbaceous cover. The litter layer is poorly developed. The species is edaphically restricted to loose, unweathered Mazama pumice and individuals are inconspicuous, owing to their small stature and pale foliage. Spores are wind dispersed and likely washed deep into the substrate pending germination. Whittier (1973, in Vrilakas, 1984) reports that *Botrychiums* may require a endophytic mycorrhizal symbiont for survival of both the sporophyte and subterranean gametophytic phase. The ability or inability of the mycorrhizal fungus to migrate may limit the distribution of the fern. Deer, elk and rodents lightly browse the plants, and it is thought that browsing pressure prior to sporulation may decrease fecundity. Population trends are considered stable, but some populations may be declining. Threats to *B.*

*pumicola* in the high desert are largely related to fire suppression. Mature *Pinus contorta* stands are subject to insect and disease outbreaks, and these stands have a significant build-up of natural fuels that, when ignited, may have the potential to superheat the soil and destroy the gametophyte. Vehicular traffic associated with wood cutting uproots plants in fragile pumice sites, and alpine sites are occasionally damaged by hikers.

*Calochortus longebarbatus* Wats. var. *longebarbatus* is a regional endemic with a broad but clustered distribution. The northern portion of its range extends from Yakima and Klickitat Cos., Washington, south to Wasco Co., Oregon. The southern portion falls within the southern East Cascades physiographic province and extends from Klamath and Lake Cos., Oregon, to the Modoc Plateau (Modoc, Shasta, Siskiyou Cos.) in northeastern California. Fifty-two occurrences are reported from Klamath and Lake Cos., and within this province, the Sycan district appears to have the greatest concentration of populations. In addition, there are two sites in Wasco County and four occurrences in Union County. The Wasco County sites have been reported to be similar to *Calochortus longebarbatus* var. *peckii* as some flowers appear to be sterile (R. Helliwell, pers. comm). In the Columbia River Basin Province, all four of the occurrences in Washington are on private land in Yakima, Klickitat, and Whitman Counties and there are 17 occurrences in Yakima and Klickitat Counties, mostly on private land. *Calochortus longebarbatus* var. *longebarbatus* is found on clay loams in vernal moist sites, notably within thin soiled swales and along stony drainages of open meadow habitats, riparian zones and floodplains. Typically these swales are distributed among a matrix of conifer stands, most often pine types. In this habitat it is most often found growing in a band along the most moist portions of dry meadows or the drier areas of wet meadows (Kaye 1991). Individuals are found on drier, higher ground within moist *Deschampsia cespitosa*-dominated meadows, in small forest openings, along intermittent or ephemeral stream courses and occasionally beneath *Pinus ponderosa* or *Pinus contorta* at the margins of open meadow and herbaceous vegetative cover is generally high (>75%). In Washington, *Calochortus longebarbatus* var. *longebarbatus* is found from 1800 to 3000 ft. in elevation and in Oregon, site elevations range from 4500 to 5500 feet.

Soil moisture appears to control the distribution and phenology of this perennial herb. The ephemeral moisture in *Calochortus* habitat is supplied either through precipitation or subsurface flow, but water does not collect at the site to create anaerobic soil conditions (Jokerst 1983). It appears that, winter and spring moisture levels determine the percentage of the population that will flower that season, with spring moisture being critical. *Calochortus longebarbatus* var. *longebarbatus*, a fertile diploid, reproduces from seed and vegetatively from a bulblet borne at the base of the plant. Significant variability in the expression of below-ground populations has made census and monitoring difficult. A major portion of the population resides in the below ground bulb bank. The bulb is embedded deep in the soil, and above ground structures may be absent in drier years. Ownbey (1940) suggests that modern populations are relicts of a distribution that was once more widespread. Alteration of the hydrologic regime due to many activities is a principle threat to this species. Channelization and construction of impoundments for livestock appear to have had a detrimental effect on populations. Herbivory, trampling, forage seeding, competition, and compaction of moist soils by livestock also create negative impacts. Sod forming exotic grasses also pose a major threat to this species. Many grazed meadow populations are still extant, although they may be of low quality; likewise, many

meadow habitats suitable for *C. longebarbatus* var. *longebarbatus* do not support the subspecies. Timing and duration of livestock visitation will influence the capability of this plant to withstand grazing impact. While early-season grazing is clearly detrimental, low to moderate late summer-fall grazing may be acceptable. Changes in the historical fire regime (fire suppression) may have impacted this species by allowing the encroachment of trees and shrubs onto its meadow/meadow edge habitat. *C. longebarbatus* var. *longebarbatus* is sensitive to spring/early summer burning but tolerates low intensity fall burning. Timber harvest and road construction threatens this species through changes in hydrology from soil compaction and site conversion on adjacent timber stands. Dispersed campsites (e.g., hunting camps) may also have the same effect. Intensive grazing in meadows with *C. longebarbatus* var. *longebarbatus* has been correlated with population declines (Kaye 1991). The population trends of are unknown, and it is suspected that some populations may be in decline. A conservation strategy is in place on the Fremont NF (Kaye and Wooley 1994) and in preparation on the Winema NF (Goldenberg and Jean 1995).

*Calochortus longebarbatus* Wats. var. *peckii* Ownb. is a restricted local endemic. In the Blue Mountain Province it is known from 161 occurrences in Crook, Harney, and Wheeler counties, Oregon. It is found at sites ranging from 4300 to 5200 feet in elevation. Habitat is almost identical to that listed for *C. longebarbatus* var. *longebarbatus*, vernal moist, low gradient draws and streambeds, and in broad meadow basins where it is situated between the wettest parts of the meadow and the forested edge. Unlike its fertile diploid relative, *C. longebarbatus* var. *longebarbatus*, *C. longebarbatus* var. *peckii* is a sterile triploid (Fiedler and Zabell 1994), and reproduces vegetatively through the production of bulblets that form at the base of the plant and by bulbils that form in the flower axils (Kagan, pers. comm). Bulblet dispersal mechanisms are unclear, though rodents have been suspected. Genetic studies are currently underway to determine the phylogenetic affinities of *C. longebarbatus* var. *longebarbatus* and *C. longebarbatus* var. *peckii* (Fiedler and Zabell 1994). Monitoring studies were initiated in 1993 to assess the effects of fire and grazing on this species. Significant variability in the expression of below-ground populations has made census and monitoring difficult. A major portion of the population resides in the below ground bulb bank. The bulb is embedded deep in the soil, and above ground structures are absent in drier years. It appears that, winter and spring moisture levels determine the percentage of the population that will flower that season, with spring moisture being critical. While early-season grazing is clearly detrimental, low to moderate late summer-fall grazing may be acceptable. Changes in the historical fire regime (fire suppression) may have impacted this species by allowing the encroachment of trees and shrubs onto its meadow/meadow edge habitat. *C. longebarbatus* var. *peckii* is sensitive to spring/early summer burning but appears to tolerate low intensity fall burning. This species faces the same threats as reported above for *C. longebarbatus* var. *longebarbatus* in the Blue Mountain Province. A conservation strategy is in preparation on the Ochoco National Forest.

*Calochortus nitidus* Dougl. is a regional endemic currently known only from scattered, isolated populations in Idaho and (historically) southeastern Washington but was once widely distributed throughout the Palouse region of northern Idaho and adjacent Washington from three sites on private land in Garfield and Whitman Counties. This species can be found in a broad range of late seral habitat types from Palouse grasslands to mixed Doug-fir/ponderosa pine stands. Extant

populations are usually small and appear to be distributed along the margins of the species' former range. This very large flowered species can be difficult to survey for because flowering is precipitation dependent and consequently, population sizes appear to be highly variable between years. Though this species is highly palatable to cattle, grazing impacts vary among sites and the indirect impacts (soil compaction, facilitation of weed invasion, etc.) that contribute to habitat quality decline are a greater problem than simple consumption. The most recent status and survey report available for this species is Caicco 1992.

*Camissonia pygmaea* (Douglas) Raven is a regional endemic in Oregon and Washington, known only from historic locations in Wheeler, Crook, and Harney Counties in Oregon (though possibly rediscovered in Harney County by Holmgren in 1996) and is extant in Washington from Douglas, Grant and Franklin Counties. There were 10 occurrences recorded as of 1992, two historic, and eight recent. In 1992 BLM Botanist, Pam Camp tried to relocate these occurrences and was only able to find five (Camp 1992). The plant grows on ash soils derived from John Day volcanics and on the soil interface adjacent to basaltic cliffs on slopes of 30 to 60% from 1800 to 2000 ft. in elevation. Habitat has diminished from heavy trampling by cattle. Gravel operations, roadside spraying and drift, and exotic plant invasion are significant threats.

*Carex lenticularis* Michx. var. *dolia* (Jones) Standley is a peripheral taxon in Montana, with the majority of its range extending northward through Alberta, British Columbia and Yukon in western Canada, to Alaska. Seven occurrences are currently documented for Montana, in Flathead and Glacier counties. These sites are all concentrated in two areas in Glacier National Park, and are the only occurrences known in the lower 48 United States (Lesica 1988). This variety occurs in shallow, wet, stony soil around streams and in seepage areas in the alpine zone, at elevations from 6,700 to 8,000 feet (Lesica and Shelly 1991; Standley 1985). Appropriate habitat appears to be limited in Glacier National Park, however; areas of gentle, perennially wet terrain over 7,000 feet are not common. Recreational impacts, and construction of recreational facilities such as boardwalk trails, have affected occurrences of this variety in the vicinity of Logan Pass, a heavily-used area of Glacier National Park. Invasion of occupied habitat by mosses, with resultant declines in numbers and flowering of *C. lenticularis* var. *dolia*, also appears to be a factor influencing this taxon (Lesica 1988).

*Carex parryana* Dewey ssp. *idahoae* (Bailey) Murray is a regional endemic, restricted to southwest Montana and adjacent Idaho. Subspecies *idahoae* is very similar to ssp. *hallii*; Murray (1969) provides a key and discussion of this complex. Fourteen occurrences are currently documented in Montana, in Beaverhead, Madison, Powell and Silver Bow counties. It has recently been proposed for redesignation as a Category 2 candidate (it is currently in Category 3C) (B. Heidel, pers. comm.). The habitat for this taxon consists of wet meadows and minerotrophic fens in regions of calcareous parent material, at elevations of 6,500 to 8,500 feet; the sites are located in flat, depositional land form areas (Lesica and Shelly 1991; Montana VP panel notes). Most of the populations in Montana are small in size, and the habitat at many sites is in poor condition from heavy livestock grazing. In addition, one site has been modified by ditch diversions and irrigation, resulting in artificial flooding. A conservation strategy is needed for this taxon.

*Castilleja chlorotica* Piper is a regional endemic known from eighty-seven occurrences in Deschutes, Lake and Klamath Counties, Oregon. Holmgren (1971, in Wooley and Phillips, 1994) suggests that the present distribution is discontinuous and may be relictual from a formerly more widespread distribution. A "perennial forb that generally grows in shrub-graminoid openings on exposed, well-drained slopes and summits at mid to high elevations" (Wooley and Phillips, 1994), it also occurs at low to mid-elevation sites that are entirely shrub-dominated. *Castilleja chlorotica* is a hemi-parasite, most often on *Artemisia tridentata*, but is also found in association with *Purshia tridentata* in *Pinus ponderosa* or *Pinus contorta* communities. Flowers are pollinated by members of the genera *Bombus* and *Osmia*, and seeds are wind and gravity dispersed. The host-parasite relationship is of great importance when assessing threats and management implications. Species occurrence is strongly associated with canopy gaps or open canopy conditions where understory light, water, and nutrient availability are high. Prescribed fire and silvicultural treatments may enhance *C. chlorotica* habitat, but survival of mature *Artemisia tridentata* and *Purshia tridentata*, neither of which are fire resistant, requires appropriate timing and spatial arrangement of prescribed fire treatments for maintenance of the crucial hemi-parasitic relationship. An additional threat to these populations is the possibility that *C. chlorotica* may hybridize when other species of *Castilleja* are present. Populations are generally considered stable, although those located within *Pinus ponderosa* communities may be at risk due to fire suppression and high fuel loads. A species conservation strategy (Wooley and Phillips, 1994) is in place on the Fremont National Forest.

*Castilleja christii* N. Holmgren is a very localized endemic native to high elevation meadows atop Mt. Harrison in the Albion Range in southern Idaho (Moseley 1993). Extensive searches of adjacent areas have failed to locate additional populations. The US Fish and Wildlife Service, Sawtooth National Forest, and the Idaho Department of Fish and Game Conservation Data Center are currently building a conservation agreement for this species. The population trend for this species appears stable. The only threats to this species are from road improvements and the increasing recreational use of the site.

*Castilleja cryptantha* Pennell & G. N. Jones is a local endemic in Washington and only is known from the north side of Mt. Rainier. There are two occurrences, both on National Forest Service land in Yakima County. It is known from subalpine and alpine meadows on slopes of zero to 20%. It grows on pumice with organic debris, in well-developed deep soils, in areas with late snowpack and high soil moisture, and ranges from 4500 to 7000 ft. in elevation. This species is susceptible to changes in moisture regimes and needs a maritime climate. Seedling establishment for this perennial is thought to be infrequent in subalpine meadows. The biggest threats are human trampling and grazing by horses used for recreation. The invasion of conifers may also be a threat.

*Castilleja pilosa* (S. Wats.) Rydb. var. *steenensis* (Penn.) N. Holmg. is a local endemic restricted to high elevation sites (>6500 feet) on Steens Mountain, Harney Co., Oregon. Thirty-five occurrences have been reported, with some contiguous, where suitable habitat exists. Morphological and geographical characteristics manifest in the three varieties of *C. pilosa* suggest that the complex has recently evolved. *Castilleja pilosa* var. *steenensis* combines characters of both varieties *pilosa* and *longispica* (Cronquist et al. 1984). No overlap in

occurrence of *C. pilosa* var. *steenensis* and *C. pilosa* var. *pilosa* has been observed, however. Variety *steenensis* generally occurs on exposed summit ridges and cirque rims, but is also found on northern aspects at lower elevations on the west side of Steens Mountain. It is found in forb-dominated communities, rather than in shrubland or grassland types. Sites are generally rocky and exposed, and total vegetative cover ranges from 5 to 30 percent. Grazing pressure is low in occupied communities, but the species has withstood historic overgrazing. Closely monitored, low-intensity grazing may favor *Castilleja* by reducing grass cover, as var. *steenensis* has been observed to decrease with an increase in bunchgrass. Fire suppression may have led to increased shrub cover and habitat loss. Recreation is a possible threat, where trampling becomes severe. Populations appear to be stable.

*Castilleja rubida* Piper is a restricted local endemic, known from seven occurrences narrowly distributed in the Wallowa Mountains of Wallowa County in Northeast Oregon. It grows on substrates derived from Hurwal sedimentary soils or Martin-Bridge formation limestone. Its habitat is alpine scree, bare cliffs, alpine plateaus and ridgetops, cirque basins, alpine turf and upper slopes. This species is found between 7,500 and 10,100 feet in elevation, on all aspects, often with *Trisetum spicatum*, *Erigeron chrysopsidis* var. *brevifolius* and *Ivesia gormanii*. *Castilleja rubida* appears to be a partial parasite on these species as well as other native alpine grasses (Kagan 1987). Growing on cool mountain tops, this geographically restricted alpine species could be threatened by global warming as its refugia would be limited. Mountain goats in the area of *Castilleja rubida* do not appear to feed on this species (Kagan 1978).

*Chaenactis cusickii* Gray is a regional ash endemic from the Owyhee River region of Oregon and adjacent Idaho. It is found at elevations between approximately 2000 and 4200 feet, on ash outcrops weathered to clay with low percolation rates. It is often associated with *Allium* spp. and a variety of annuals, including the rare *Mentzelia mollis*. Reactivation of bentonite and zeolite mining in the area poses a threat, and some sites have already been disturbed by such activity. Gold mining developments are proposed at one site. During high moisture years, invasion of *C. cusickii* habitat by exotics, notably *Lepidium perfoliatum* and *Centaurea solstitialis*, is also a threat. Livestock grazing and off-road vehicle (ORV) use are identified as moderate threats. This species is decreasing rapidly. A recent status report is available for this species (Moseley 1994).

*Chrysothamnus parryi* (Gray) Greene ssp. *montanus* L. Anderson is locally endemic to a very small area in the Red Conglomerate Peaks of the Beaverhead Range, in Beaverhead County, Montana and adjacent Clark County, Idaho; the area occupied is less than 2,000 acres (Lesica 1992). It is currently known from four occurrences in this limited area, one of which extends into Montana. The taxon occurs near timberline on stony, poorly developed soils derived from calcareous parent material of the Beaverhead Conglomerate formation (Mancuso and Moseley 1990). Specifically, it occurs on slopes or windswept ridge crests with southerly exposure, between 8,000 and 10,000 feet (Mancuso and Moseley 1990). Most of the Montana portion of the Red Conglomerate Peaks area consists of north-facing slopes; thus, there is little available habitat in the state. The Montana site is at 9,300 feet on a 50% slope with a 170 degree aspect. The sites are sparsely vegetated; in Montana, total shrub, graminoid and forb cover were estimated to be 1%, 10% and 10% respectively. The total number of plants globally is estimated

to be approximately 3,600 (Lesica 1992). This species is an important source of cover for wildlife in its windswept habitat. The habitat is remote, and there are no apparent threats at this time. However, small population sizes and local distribution make the taxon vulnerable to any disturbances in the area. The plant should be given consideration in all management decisions related to the Red Conglomerate Peaks area, and the condition of populations should be monitored (Lesica 1992).

*Claytonia lanceolata* Pursh var. *flava* (A. Nels.) C.L. Hitchcock is a local endemic that occurs at the ecotone of *Artemisia cana*/forb/grass community and ephemeral wet meadows between 6,450 and 6,500 feet around Henry's Lake in southeastern Idaho. All populations of this taxon are on private land. Population trends are currently stable however threats due to introduced plant species and land conversion are seen as significant. This taxon is being reclassified as *Claytonia rosea* ssp. *multiscapa*.

*Claytonia umbellata* Wats. is a regional endemic of Oregon. It is known from Wasco, Harney, and Crook Counties and California and Nevada. It grows on basaltic dry rock channels from 4000 to 4800 ft. in elevation, in biscuit scablands. Populations are small and the range of the plant has decreased. Significant threats include gravel pits and exotic weed invasion. Currently this species is on the "watch-list" for Oregon Heritage.

*Collomia mazama* Coville is a regional endemic of the southern Cascade Range known from fourteen occurrences in the southern East Cascades province, Klamath Co., Oregon. A slender taprooted perennial, it occurs in open, mesic forest environments at elevations ranging from 4700 to 6500 feet. Soils include glacial tills and those of volcanic origin. Lower elevation sites are generally riparian. *Collomia mazama* is associated with young and multi-strata stands in *Abies magnifica* var. *shastensis*, *A. concolor* and *Tsuga mertensiana* forests. In *Pinus contorta* forests, *C. mazama* occupies stands where understory reinitiation is occurring. Fruits ripen in mid-to late summer, at which time seeds are ballistically expelled from the capsule. Recruitment appears highest on substrates where duff has been removed. Threats are low and are limited primarily to trampling by recreational hikers at Crater Lake National Park and along developed trails on the Klamath RD, Winema NF. The species is absent from clearcuts, but appears to persist in stands characterized by partially open canopies. Population trends are unknown at this time. A conservation strategy is being developed on the Winema NF, and genetic studies are being conducted in cooperation with the University of Idaho.

*Collomia renacta* Joyal is a newly described scattered endemic known from three occurrences in south central Malheur Co., Oregon, including one site near Star Mountain, mainly in federal ownership and one occurrence in Nevada. *Collomia renacta* is an annual, believed to be autogamous, and is found on poorly developed, basalt-derived soils on southern aspects between 5200 and 5700 feet in elevation. Mature fruits are released *in situ*, and may be dispersed by passing animals. Grazing and road construction are possible threats, as is invasion of sites by exotics. If increased fire frequencies were to convert the native vegetation to communities dominated by exotic annuals, *C. renacta* would be unable to compete. Little is known about population trends at this time.

*Cymopterus acaulis* (Pursh) Raf. var. *greeleyorum* Grimes & Packard is a local endemic known from Malheur Co., Oregon, and from additional sites in Idaho. Occurrence data for Oregon is unavailable at this time. The species is found on Succor Creek Formation ash weathered to montmorillonite, and early spring precipitation is essential to successful reproduction and growth on these xeric sites. As with other ash endemics of the Owyhee Uplands, it is potentially threatened by mining, off-road vehicle (ORV) traffic, and other ground disturbing activities. Invasion of sites by exotic species may also be a threat. Population trends are unknown.

*Cymopterus davisii* R.L. Hartman is a local endemic occurring at high elevations on Mt. Harrison and Cache Peak in the Albion Range in southern Idaho. Little is known of this species other than that it occurs in subalpine grassy slopes and rock outcrops (Moseley 1993). This taxa occurs on relatively deep gravelly soils derived from quartzite, disturbed by pocket gophers, frost heaving or a similar type of disturbance. It generally occurs on north facing aspects, although there are south facing sites occurring in depressions where snow lies late into the summer. It does not occur on wind swept ridgelines where soils are shallow. Population vigor appears to be excellent. Threats appear to be minimal with exception of the influence of a radio transmission site on Mt. Harrison.

*Cymopterus douglassii* R.L. Hartman & L. Constance is a regional endemic found at high elevations on all aspects from flat ridgelines to relatively steep scree slopes in the Lost River and Lemhi Ranges in eastern Idaho. This species is usually found on carbonate substrates in subalpine basins, open subalpine woodlands and grasslands. The occurrences are limited in size but appear to be in otherwise good condition, with the populations dense and vigorous. Little is known about the biology or ecology of this species and no threats were identified during the panel process. The Idaho Conservation Data Center is currently preparing a status survey for this species.

*Cymopterus nivalis* Hartman & Kirkpatrick is a scattered endemic known from Idaho, Nevada, Utah, Montana, and Wyoming. The Oregon Basin and Range populations, including sites at Steens Mountain and Table Rock, represent the western most extent of the species. The dry, rocky sites on which it is found, notably volcanic tuffs and bald areas with less than 30% vegetation cover and at elevations between 4200 to 8900 feet. *Artemisia arbuscula* is a common associate. *Cymopterus nivalis* exploits early spring moisture provided by rainfall and snowmelt. A deeply-taprooted perennial, it aids in soil stabilization and nutrient cycling on otherwise sterile mineral substrates. Potential threats to the species include early season grazing and vehicle traffic. Road and area closures designed to protect two sites in Lake Co. have resulted in a significant increase in the number of individuals present at those sites. Population trends appear to be stable at this time.

*Cypripedium fasciculatum* Kell. is an orchid with a widely scattered distribution in the western United States; it is known to occur from southern British Columbia, Oregon, Washington, to southern California, east to Colorado, Idaho, Montana, Utah, and Wyoming (Brownell and Catling 1987). In Montana, 17 occurrences of the species have been documented in the northwest and west-central portions of the state, in Lake, Mineral and Sanders counties. The

species occupies a variety of coniferous forest cover types, but in Montana it does not typically occur in stands that have a closed canopy; it prefers more open, mid-seral stand conditions. Associated cover types include Douglas-fir/ninebark, ponderosa pine, and western red cedar mixed conifer stands, usually in warmer microhabitats. In the Blue Mountains, one occurrence in Baker County, Oregon, has not been relocated since reported. In this province it is found between 2,500 and 6,500 feet in elevation under the filtered sunlight of open parkland-like conifer stands or deep shade of old growth conifers. It is also reported to be associated with *Holodiscus discolor* or *Pachistima myrsinites* on basalt derived soils. In Idaho, it is found on the river breaks of central and northern Idaho in low elevation (1,000 to 3,000 feet) forests with greater than 50% canopy closure, an area concurrent with the maritime refugium (sensu lato). In Washington, most of the 50 locations in Chelan, Kittitas, Klickitat and Yakima Counties are on federal and state land, yet it is known from only one occurrence each in Columbia and Garfield Counties, Washington. There are also two occurrences, both on public land in Whitman and Kittitas Counties, Washington. One isolated population is surrounded by wheat fields, so a significant threat is the isolation of populations as have under a dozen plants. It grows under mid- to late seral *Pseudotsuga menziesii*/*Pinus ponderosa* overstories with a closed herbaceous layer and variable shrub layer, mostly on northerly aspects about 4500 ft. in elevation. It can also be found in *Abies grandis* forests with Swauk sandstone, thick duff or sandy loam soils. Slopes range from 5 to 75% and canopy cover varies from 25 to 80%. Populations are on upper, mid- or lower slopes, as well as ridgetops. It ranges from 700 to 5300 ft. in elevation. It is limited to well-drained sites. Most populations are small and reproduction is low. At all sites in the ICBEMP the scattered, generally small, character of most of the populations seems to be contributing to poor reproductive success.

The pollination and reproductive biology of this mycotrophic species is poorly understood and apparently complex. The seed requires a mycorrhizal fungal associate to germinate and survive. Fruit set may be limited by pollinator availability. Also, pollinator success seems to be dependent on climatic conditions, a phenomenon that has been observed for other orchid species (Montana VP panel notes). Demographic monitoring studies have indicated that the plants may not be present above ground every year, which is also typical of many orchid species. Insect and ungulate herbivory threaten some populations. In fragmented forests, the thermal cover provided by overstory species frequently leads to livestock and wildlife trampling of *C. fasciculatum* in the understory. Spring burns, and severe stand replacement fires are harmful, but mild fall underburns may benefit *Cypripedium fasciculatum*. Historic changes in the native fire regime are considered a threat as is canopy removal; yet fire suppression, and resultant canopy closure, also do not appear to be suitable to the species. The effects of selective logging are not well understood. The mechanical impact and resulting increase in solar radiation from clear-cutting is detrimental to population viability. Recreation, road building, development, and off-road vehicles are also threats. The most recent status survey for this species is Moseley, 1992 (for the Caribou NF) and a species management guide was prepared for it in 1990. A conservation strategy is needed for this species in Montana and Idaho, as the occupied habitats are frequently targeted for timber harvesting.

*Delphinium viridescens* Leiberger is a local endemic to the Wenatchee Mountains of Washington. In the East Cascades North Province, 24 locations are known in Chelan and Kittitas Counties,

fourteen are on National Forest Service land. Populations range from 13 to several hundred plants along 300 ft. of a riparian area. This perennial plant occurs in moist openings in *Pseudotsuga menziesii* and *Pinus ponderosa* forests from 1500 to 4050 ft. in elevation. It is also found in openings in aspen groves and along the edges of shrub thickets, such as *Crateagus douglasii*. Other habitats include wet meadows, seeps, and roadsides. This plant tends to grow in poorly drained microsites, which dry out in the summer. Changes in hydrological regimes, grazing, timber harvest, and developments are major threats.

***Descurainia torulosa* Rollins** is a regional endemic of Wyoming, that occurs in the Absorka Mountains and the Rocksprings Uplift on sparsely vegetated sandy slopes at the base of cliffs and boulders of volcanic conglomerate or sandstone at elevations of greater than 8,300 feet. Populations of this alpine mustard are typically small, with the total population in this area of less than 200 plants, with a mean population size of 25 plants and some disappear for one or more years at a time. Populations seem to be decreasing though there is much interannual variation in numbers of individuals. On sites within the ICBEMP area, threats are considered low due to the inaccessibility and ruggedness of the sites. All known *D. torulosa* sites are on federal lands.

***Douglasia idahoensis* D. Henderson** is a regionally endemic primrose found on scattered north (NW-ENE) facing ridge systems on the Idaho Batholith. It is known only from Forest Service lands (Boise and Nez Perce NFs). The high elevation slopes (6,000-9,500 feet) that *D. idahoensis* inhabits typically have very low vegetation cover (typically 10-15% but ranging from 5-50%), and are very steep (slopes 4-100%). The majority of *D. idahoensis* populations occur on granite but one or two are known from quartzite. In all cases, the substrate is poorly differentiated, generally coarsely decomposed bedrock (residuum) with poor to high stability. This species is pollinated by a diverse assemblage of small bees and flies. A graduate student at the University of Idaho (Angela Sondenaa) is currently researching the reproductive ecology of this species. Changes in the fire regime seem to be a problem for this species. The large fires of 1994 burned over some populations on the Boise National Forest killing many individuals. Grazing (sheep) is a potential threat that is easy to mitigate with proper (effective) controls. Many populations of *D. idahoensis* occur near popular recreation sites and some human trampling and habitat disruption has been observed. Mining is a potential threat in some locations. Timber harvest is not viewed as a threat because it occurs in the whitebark pine and subalpine fir zones, species with little commercial value. The Boise National Forest, in conjunction with the US Fish and Wildlife Service is currently conducting a long-term monitoring study to assess the viability of the species at the southern margin of its range.

***Draba trichocarpa* Rollins** is locally endemic to the Stanley Basin of Idaho. It is restricted to southerly aspects with shallow gravely soils of decomposed granite at elevations of less than 7,500 feet. It is suspected that the specific microsites in which *D. trichocarpa* occurs are blown free of snow in winter. This species is found in approximately twenty small populations, some of which it shares with the rare *Eriogonum meledonum*. Current threats to *D. trichocarpa* population viability are seen as low but increasing development in the Stanley Basin has the potential to become a significant problem in the future (both through land alteration and associated increases in human activities such as recreation and road construction). Though seed

viability of this species is known to be high, a three year monitoring study suggests that populations are in long-term decline (Moseley and Mancuso 1990, 1991, and 1993). This taxa may occur with *D. trichocarpa* var. *treleasei* and the two varieties freely intergrade with one another.

*Erigeron basalticus* Hoover is a local endemic to Yakima and Kittitas Counties in Washington. In the Columbia River Basin Province, there are nine occurrences, four of these are on federal land. It is known from basalt outcrops, cliffs, and cracks. Soils include colluvial and aeolian deposits. It ranges from 1300 to 1700 ft. in elevation on aspects from northwest to southeast, preferring the more northerly and generally not on direct south-facing sites. Lichens are often noticeable on the basalt. This perennial species provides showy flowers (food) within an area somewhat devoid of other showy species and blooms in the spring and fall. Plants trap wind-blown material for soil build-up in cracks. Construction of roads has probably meant the loss of habitat. Exotic plants are a significant threat.

*Erigeron lackschewitzii* Nesom & Weber is a local endemic restricted to the Flathead and Rocky Mountain Front (Sawtooth) ranges in northwest Montana. The species is currently known from a total of 12 sites, in Flathead, Lewis and Clark, Pondera, and Teton counties, and an estimated total of approximately 1,800 individuals (Heidel 1993). It is confined to open, gravelly, calcareous soils and talus on ridge tops and in tundra in the alpine zone, and flowers in July and early August; this habitat serves as winter range for some big game species. The species is most frequently found on southwest aspects; it prefers midslopes between scree and toeslope turf, or gentle but highly exposed slope crests and ridgelines, at elevations from 6,400 to 8,200 feet. Most sites fall within the *Dryas octopetala*/*Carex* spp. plant association (Heidel 1993). Although the taxonomic recognition of this taxon has been questioned (i.e., Dorn 1984), recent systematic studies, employing morphological and molecular techniques, indicate that the species is sufficiently distinct from *E. ochroleucus* var. *scribneri*, its closest relative, to warrant species status (Kerstetter 1994). A persistent lack of pollen, coupled with the presence of fully formed achenes at a very early state of floret development, suggest apomixis (asexual reproduction of seeds). Populations of *E. lackschewitzii* most likely resulted from selection for traits often found in other polyploid derivatives that colonize areas left barren after glaciation, with maintenance of the adaptive genotype through apomixis (Kerstetter 1994). Nine of the 12 known occurrences are in or on the boundaries of two Wilderness Areas (Bob Marshall and Scapegoat wilderness areas). There has been little management activity in the occupied habitat apart from the construction of lookout towers, the latter having since been taking out of operation; proximity of hiking and pack trails near the populations also do not appear to pose potential threats, nor do disease, predation or grazing (Heidel 1993).

*Erigeron latus* (A. Nelson & J.F. Macbride) Cronquist is a regional endemic native to rhyolitic gravels in southwestern Idaho and adjacent northern Nevada. It occurs on flats (slopes of less than 10%) at elevations ranging from 4,200 to 6,450 feet (Moseley and Mancuso 1993). The most serious threat to this species' viability is the invasion of exotic plants (especially from the consequent increase in fire frequency), though conflicts also arise from juniper eradication programs and livestock grazing.

*Eriogon salmonensis* S.J. Brunsfeld & Nesom is locally endemic to a 30 mile stretch of the Middle Fork Salmon River in Idaho, with a single disjunct population downstream from Shoup on the Salmon River. This species is restricted to north slopes and grows in cracks and ledges of massive cliffs and large rocky outcrops (primarily granite and metamorphics). The current population trend is assumed to be stable (though there is no monitoring data to support that supposition). Since most populations of *E. salmonensis* are in wilderness, the species is probably safe from most anthropogenic threats.

*Eriogonum chrysops* Rydb. is a very narrowly distributed local endemic of the Owyhee Uplands, with a range of 5 by 2 miles and total number of individuals less than 10,000. The species is known from five occurrences in Malheur Co., Oregon. Of the three main populations, one is on private land and the remainder are on BLM lands. The species is closely related to several other rare *Eriogonum* species in the *Eriogonum chrysops* complex, including: *E. crosbyae*, *E. prociduum*, *E. cusickii*, and *E. ochrocephalum* (Hitchcock *et al.* 1964). Habitat is scabland of shallow, rocky, basalt- and rhyolite-derived soils. Site topography ranges from nearly level areas to broad outcrops on ridges or hills. *Artemisia arbuscula* is a common associate. *E. chrysops* is a pioneer species, and vegetative cover at these sites is sparse, up to 2 percent cover. Individuals may aid in soil development by fracturing rocky substrates and contributing to litter accumulation. Threats are thought to be minimal, although trampling by livestock may be detrimental. Pedistled plants have been observed, indicating soil loss at least one site. Population trends are considered stable.

*Eriogonum crosbyae* Reveal is a local endemic occurring at nine sites in southern Lake and Harney Cos., Oregon, and at five sites in Nevada. Extensive searches have been performed, and new populations are not expected in Oregon. The species grows on gently rounded ridge tops and upper slopes on light brown or tan volcanic tuffs at elevations between 5280 and 6600 feet. Communities are characteristically barren, with vegetative cover of less than five percent. Associated species include *Ivesia rhypara* var. *rhypara*, as well as *Mentzelia albicaulis*, *Cryptantha* sp., *Gilia congesta*, *Lygodesmia spinosa*, *Atriplex spinosa*, *Astragalus tetrapterus*, *A. purshii*, *Orobanche fasciculata*, and *Penstemon speciosus*. The pollinators for this *Eriogonum* complex are specific to the taxon and include flies and wasps. Once mature, achenes break easily for wind dispersal. *Eriogonum crosbyae* populations are in a declining trend, as a gradual decrease has been observed in numbers over the last ten years. Gold mining and off-road vehicle (ORV) use are threats in Nevada, but do not yet appear to be impacting Oregon populations. An Oregon conservation agreement between the BLM and USFWS is slated for completion in 1995.

*Eriogonum cusickii* M.E. Jones is a regional endemic known from nine occurrences in northern Lake and Harney Counties, Oregon, in the Basin and Range physiographic province. Sites are located at elevations between 4400 and 5300 feet. *Eriogonum cusickii* is a pioneer species that grows on relatively flat, barren, welded tuff outcrops. Vegetative cover is sparse, rarely exceeding 5 percent. *Juniperus occidentalis* and *Artemisia arbuscula* are common associates, along with *Cymopterus nivalis*, *Lewisia rediviva*, *Gilia congesta*, *Lesquerella occidentalis*, and *Dimeresia howellii*. Population trends are considered stable, and monitoring has shown that some populations are increasing in size. Threats appear to be minimal, but invasion of roadside sites by exotics is a potential problem. Successful recovery of sites following an ORV closure

suggests that off-road vehicle traffic has also been detrimental. All Oregon populations will be covered by a conservation agreement to be completed in 1995.

*Eriogonum lewisii* Reveal is a northern Nevada regional endemic that occurs at elevations between 7,300 and 9,600 feet on exposed ridgetops on poorly developed limestone or dolomite soils or residuum. Roads and mining are seen as significant threats to the viability of several populations. Fire suppression activities, exotic plant species, and livestock grazing are seen as important threats across the species' range. Population trends for this species appear to be downward.

*Eriogonum meledonum* Reveal is locally endemic to the Stanley Basin of central Idaho. It occurs at elevations below 7,500 feet on granite derived substrates (residuum) at sites with full exposure. Known populations appear to be stable but a preliminary monitoring study indicated that long-term viability may be in jeopardy (Moseley and Mancuso 1990, 1991, and 1993a). The most consistent threat to *E. meledonum* populations stems from trampling by livestock. Additionally, development and road construction may become threats to some populations as the human population in the Stanley Basin increases.

*Eriogonum novonudum* Peck is a regional endemic of the Owyhee Uplands. It is known from Malheur Co., Oregon, where it is found on gravelly-textured Leslie Gulch ash. Occurrence data is unavailable at this time, and it appears to be common and is no longer tracked by the Oregon Natural Heritage Program. Within communities that support *E. novonudum*, *Agropyron spicatum* is generally dominant. As with other ash endemics, the species is potentially threatened by livestock activity, notably trampling, and by recreational use, invasion of sites by exotic species and subsequent changes in the fire regime. Population trends are unknown.

*Eriogonum prociduum* Reveal is a regional endemic found in Lake and Klamath Counties, Oregon, as well as in northeast California and northwest Nevada. It inhabits gentle slopes and level areas of barren, rocky or gravelly soils with minimal vegetative cover. *Artemisia arbuscula* and *Juniperus occidentalis* generally occur adjacent to sites. Substrates include basalt, ash outcrops, and other volcanic rocks. *E. prociduum* is a perennial pollinated by flies and wasps. Mature achenes dihesce easily and seeds are wind dispersed. A road was constructed at one site, but the population is recovering following road closure. In general, population trends are considered stable. Threats appear to be minimal with the exception of off-road vehicle activity, and the species is considered stable across its range.

*Erythronium grandiflorum* Pursh var. *nudipetalum* (Applegate) Hitchcock is locally endemic to the Bear Valley area of Valley County, Idaho. Though its distribution is highly restricted, it is very common within its range. This species occurs in more or less moist meadows and meadow ecotones between 5,600 and 7,00 feet and may be able to invade small disturbances in the graminoid-forb matrix (e.g., gopher mounds). Practices that alter meadow hydrology such as diversions, creek dredging, and excessive grazing pressure are the major threats to *E. grandiflorum nudipetalum*.

*Gratiola heterosepala* Mason & Bacig. is a peripheral endemic known from one occurrence (elevation 5360 feet) in Lake Co., Oregon, and from sixteen additional sites within seven counties in northern California. An annual member of the Scrophulariaceae, it is found on clayey soils in shallow water and at the margins of vernal pools and stock ponds. The species flowers from mid-June to mid-July and is believed to be facultatively autogamous (L. Housley, pers. comm.). Field observations have shown no evidence of pre-dispersal seed predation, and seeds are likely dispersed by migrating waterfowl. Associated species include *Downingia laeta*, *Marsilea vestita*, *Plagiobothrys scouleri* var. *penicillatus*, *Eleocharis palustris*, and *Camissonia* sp. surrounded by a *Juniperus occidentalis*/*Artemisia arbuscula*/*Poa sandbergii* community. An exclosure established in 1993 on the Lakeview District BLM is being monitored to determine the effects of grazing on the species. Data collected between 1982 and 1991 shows population size at the Oregon site ranging from 2000 to 18,000 individuals. Potential threats include early season grazing, invasion by exotic species, and development in some areas. Population trends are currently considered stable.

*Grindelia howellii* Steyermark is a regional endemic with a bimodal geographic distribution; most of the occurrences are in west-central Montana, with several small occurrences also known in a very small area in north Idaho. It prefers southerly aspects in bluebunch wheatgrass/Sandberg bluegrass grasslands and openings in ponderosa pine and Douglas fir stands. The Montana occurrences, of which 60 are currently known to be extant (Pavek 1991), are in Missoula and Powell counties, in the Blackfoot, Clearwater and Swan River drainages (Shelly 1986). This species is found in a variety of disturbed and natural habitats, including roadsides, grazed pastures, pine plantations, forest openings, river terraces and native grasslands (Lesica and Shelly 1991). Numerous occurrences in Montana are adventive in disturbed habitats. Despite this ruderal response, populations in undisturbed grasslands are very uncommon. For this reason, and because the adventive populations are in most cases not likely to be viable over the long term, *G. howellii* has been retained as a Category 2 federal candidate. Follow-up surveys at 27 known sites in 1990 revealed that 10 occurrences had increased in numbers of plants, 15 had decreased, and two populations were essentially unchanged in size; ten locations have no new data available since 1986. Thus, as of 1990, a total estimate of about 16,000 individual plants, in 50 populations, was made (Pavek 1991). One of the largest populations, in native grassland habitat, was partially sprayed with herbicide in 1989, and is much smaller in size now (Pavek 1991). The invasion of its preferred sites by exotic plants is the greatest threat to the viability of this species. Historic changes in disturbance regimes and road construction are secondary but important threats. A species management guide for *G. howellii* on the St. Joe National Forest was prepared four years ago (Lorain 1991b).

*Hackelia cronquistii* J.L. Gentry is a regional endemic of the Owyhee Uplands and adjacent Idaho. It is known from forty-one occurrences comprising four population centers in Malheur Co., Oregon, and from one population center in Idaho. It can sometimes be found with *Astragalus mulfordiae*. Some populations have hundreds of plants, and one has thousands, but many are very small. In recent years, a number of new sites in Oregon have been reported from the Vale District BLM (J. Finley, pers. comm.). *Hackelia cronquistii* grows in communities of *Artemisia tridentata* ssp. *wyomingensis*, *Festuca idahoensis*, and *Oryzopsis hymenoides*. *H. cronquistii* probably requires small mammals to disperse its fruits. The species is generally

found on north-facing slopes of sandy hills, in topographic depressions that hold late-season snowpack (nival zone). Site elevations range from 2100 to 3100 feet. Soils are sandy loams, possibly with argillic horizons (clay at 14-16"), that retain moisture close to the surface. Livestock grazing and exotic plant species (and the consequent increase in fire frequency) are considered the preeminent threat. The species is somewhat palatable and is highly impacted both by intense grazing and trampling. Rested sites are recovering, and it believed that population trends are stable to increasing. Off-road vehicle (ORV) traffic is a threat, and at least one site is heavily impacted. Catastrophic fires and conversion of sites to agricultural land or pasture are also potential threats.

***Hackelia venusta* (Piper) St. John** is a local endemic to Chelan County in Washington. There are three occurrences, all on National Forest Service land. A perennial, it grows in dry loose granitic sand and crevices in granite or talus. It ranges from 1000 to 7400 ft. in elevation. Disturbance may be necessary to maintain populations. Exotic plant invasion and road sanding are the greatest threats. Since it does not compete well with other plants, fires removing competing vegetation are probably beneficial and fire suppression would affect it negatively.

***Haplopappus insecticurius* Henderson** is a local endemic found exclusively on the Camas Prairie of central Idaho and in some related meadow complexes immediately westward toward Cat Creek (in Camas and Elmore Counties, respectively). It is currently restricted to vernal wet meadows and flats with shallow, basalt derived soils. Approximately 99% of this species former habitat has been converted to agricultural uses. Population trends currently appear stable though significantly reduced from historic numbers. Extensive surveys for this species in 1994 (Blackburn) located many new populations on the northwest margin of its range. There is some inconsistency in the plants' response to livestock grazing and trampling so that it is currently unclear whether that activity is in conflict with the conservation of this species. Introduced species, land conversion, and herbicide use seem to pose the greatest consistent threats to today's populations.

***Haplopappus liatiformis* (Greene) St. John** is a regional endemic that was once widely distributed throughout the Palouse Prairie of southeastern Washington and the Craig Mountain area in adjacent Idaho. There are 26 sites in Spokane, Whitman, and Benton Counties of Washington. Most populations are under 100 individuals. Found in deep, well drained, loess soils between 2,000 and 4,800 feet, *H. liatiformis* shuns forested sites but can occur in grassland/ponderosa pine mosaics throughout its range. *H. liatiformis* occurs with some of the other Palouse endemics and grows best in stable sites in good ecological condition and does poorly in areas grazed or weedy. Most populations of this species are very small and suffer from extreme fragmentation and isolation. All are threatened by land conversion, grazing, and herbicide spray and drift. Additionally, the invasion of exotic species is making much of *H. liatiformis*' habitat unsuitable. The greatest challenge to the conservation of this species is that most populations occur on private land.

***Haplopappus radiatus* (Nutt.) Cronq.** is a regional endemic of the Owyhee Uplands and Blue Mountains province on the hillsides in the southern end of the Snake River Canyon, with five occurrences in northern Malheur County, Oregon, and is known from Idaho County, Idaho, and

34 occurrences in southern Baker County. It is found on steep (10-90% slope) rocky hillsides and gravelly terraces at elevations between 1800 and 6,100 feet although most populations are found below 3,500 feet. *H. radiatus* occurs on basalt derived soils with high clay content or calcareous derived soil, possibly from shale. Populations across the taxa's range appear to be decreasing. Sites are relatively harsh and barren, with communities often typified by *Artemisia tridentata* and *Agropyron spicatum*. It is sensitive to annual levels of precipitation, with late summer rains appearing to be essential for this species to complete its reproductive cycle and population vigor has been observed to decline when less than 11 inches of precipitation per year. The threats to *H. radiatus* are numerous and include livestock grazing, introduced exotic plant species (and the consequent change in the historic fire regime), herbicide spray and drift, and insect seed predation. Less immediate but important threats stem from mining (at least at some sites), timber harvest, and road construction (Mancuso and Moseley 1993b). Grasshoppers also threaten some populations in years of insect outbreaks. Invasion of exotic weeds is impacting both plant survival and seedling establishment. Therefore, it is threatened by increased fire frequency and/or intensity, and a disrupted historical pattern of wildfires. Road work activities exacerbate this situation by causing further soil disturbance and by facilitating increased traffic (more seed vectors).

*Howellia aquatilis* A. Gray is a monotypic genus with a scattered geographic distribution in the Pacific Northwest. The following information has been compiled from numerous status reports, publications and monitoring studies, including Gamon 1992, Lesica 1992, Lesica et al. 1988, Roe and Shelly 1992, Schassberger and Shelly 1991, Shelly 1988, Shelly 1989, Shelly and Moseley 1988, and Shelly and Schassberger 1990. *Howellia aquatilis* is known to be extant in the states of Idaho, Montana and Washington. It is historically known to have occurred in California (central Coast Range) and Oregon (in the Willamette Valley and near Portland); these previously known sites have not been relocated despite intensive field surveys in both states. Within its extant range, *H. aquatilis* is currently known from a total of 110 occurrences. There are two main centers of distribution within this range - one in the Swan River valley in Montana (58 occurrences), and one in the vicinity of Spokane, Washington (48 occurrences) mostly on public land, where population sizes vary from one to 1000 plants found from 400 to 2320 ft. in elevation. Two occurrences are known in northern Idaho in private ownership, and two others are found in western Washington. Despite this seemingly large number of occurrences, the total occupied habitat known worldwide is less than 100 acres. The Montana occurrences are all in Lake and Missoula counties. *Howellia aquatilis* is strictly aquatic and is also an annual. The plants typically bloom by June in Montana; they continue flowering until late summer, depending on how quickly the wetland habitat dries out. The species is restricted to small pothole ponds or the quiet water of shallow, abandoned river oxbows. These wetland habitats typically occur in a matrix of dense forest vegetation. All known sites have at least some deciduous tree cover (usually aspen, but sometimes birch) around a portion of the pond. *Pinus ponderosa* forests surround the ponds and *Cornus stolonifera* is usually present along the perimeters. The bottom surfaces of the wetlands consist of firm, consolidated clay and organic sediments. These wetlands are generally filled by snowmelt run-off and spring rains, but then dry out to varying degrees by late summer or early fall, depending on annual patterns of temperature and precipitation. In the Swan River valley of Montana, the small ponds in which it grows lie in depressions that were left as the continental glaciers retreated approximately 10,000

years ago. These depressions occur where blocks of ice, buried in the glacial till, later melted. The ponds are typically shallow, averaging one to two feet deep during the middle of summer. This drying is critical to the species' life cycle; the seeds will only germinate if they are exposed to the atmosphere. After the seedlings appear, usually in October, they overwinter under the snowpack. Then, in late spring and early summer the plants resume growth in the water that accumulates in the ponds. This ecological relationship has a profound influence on the size of the occurrences from year to year; the summer climate determines the degree of pond drying, and hence the amount of seed germination in the fall. If fall seed germination is much reduced, few plants are present the following summer. These highly specialized ecological adaptations make *H. aquatilis* vulnerable to a variety of natural environmental changes over the short and long term, such as advancing vegetation succession or climate change. However, the species has also been affected by land management activities and habitat destruction as well. In Oregon, most of the historical locations are within urban or suburban areas that have been extensively developed, and unsuccessful field surveys in the remaining habitat in these areas indicates that these sites have been lost. Additionally, construction of dams along the Columbia and Willamette rivers has led to a decline of suitable wetland habitats. Elsewhere in its range, including the historical location in California, livestock grazing and trampling may have eliminated occurrences. In Montana, timber harvesting has occurred immediately adjacent to a number of occupied ponds, with resultant effects on the habitat. Also, roads built immediately adjacent to some ponds have resulted in increased sedimentation from road dust. In the bottomlands near the Idaho occurrences, habitat has been altered by roads, residential housing, and cultivation. Historic sites in Idaho are known to have been extirpated and the unique vernal pools that this species occupies are threatened range-wide by sedimentation, invasion of exotic species, and alterations in hydrology (including the drainage of wetlands). In Washington, several ponds near known occurrences have been altered to improve waterfowl habitat. Habitat encroachment by *Phalaris arundinacea* (reed canary grass), an aggressive wetland species, is also occurring in Montana and Washington, where all sites have been invaded. Monitoring of plant numbers in selected ponds has revealed annual fluctuations from over a thousand plants to fewer than a dozen. This fluctuation means that the seed bank is of great importance to the long-term persistence of the occurrences. The longevity of the seeds is unknown, but studies indicate that it may be short. Lesica et al. (1988) found no detectable genetic variation, either within the occurrences or across the range of the species; this is also very unique, especially considering the species' annual life cycle and wide geographic distribution - factors that typically promote genetic variation. *Howellia aquatilis* was federally listed as threatened by the U.S. Fish and Wildlife Service (USFWS) in July, 1994. In addition, the Flathead National Forest in Montana is in the process of amending its Forest Plan to adopt conservation measures for the species, including a recently approved conservation strategy (Mantas 1995). This strategy provides protection around occupied, as well as suitable but unoccupied, habitats.

***Iliamna longisepala* (Torr.) Wiggins** regional endemic in Washington. In the Columbia River Basin Province, it occurs at 13 sites in Douglas, Chelan, and Kittitas Counties. Ten of these sites are on private land. Populations are small in size, usually less than 30 individuals. This showy shrub occurs in relatively lush riparian areas, but on the periphery of the riparian vegetation in draw bottoms, mid-slopes and upper slopes. It inhabits relatively dry, well-drained sites, which are generally within microsites that may retain water longer than adjacent microsites. Fire

suppression is detrimental to this plant. Changes in riparian vegetation associated with land-use could have negative impacts. Exotic weed invasion is also a threat as well as activities in the riparian area that impact the structure, function and species composition of the plant community.

*Ivesia rhypara* B. Ertter & Reveal var. *rhypara* is regional endemic to northern Nevada and a small portion of southeastern Oregon. This species occurs on poorly developed soils derived from hydrothermally altered welded tuff. It prefers sites at elevations between 5,390 and 5,600 feet with a southerly aspect. This plant is strongly impacted by livestock trampling and also suffers threats from mining, exotic plant species, road maintenance, range improvements, and fire suppression activities. Population trends for this species is in decline in Oregon.

*Ivesia rhypara* Ertter & Reveal var. *shellyi* Ertter is a local endemic found in the Basin and Range physiographic province, in Lake and Harney Cos., Oregon. It was discovered in 1985 by Steve Shelly, then a BLM botanist. It is known from four occurrences within three distinct population centers, in canyons and near Juniper Mountain, east of Alkali Lake. All known sites are on federal land. The species occupies microsites created by eroding pumice inclusions within tuffaceous outcrops, generally on steep to vertical rock faces. Some populations are reported to be extremely large and cover extensive areas of rimrock. Threats to the species are minimal, and populations are considered stable.

*Lathyrus grimesii* Barneby is a local endemic known only from the Independence Mountains of northern Nevada. It occurs on stony, clay rich soils and talus slopes in an elevational band between 6,100 and 8,300 feet. Important threats to populations of *L. grimesii* include livestock grazing, mining, the impacts of exotic plants (and the herbicides used to control them), and changes in the historic fire regime. Populations of this species are often large and currently appear to be stable.

*Lepidium davisii* Rollins is a regional endemic with highly specific habitat requirements that is native to southwestern Idaho and adjacent Oregon. It only occurs in barren (<5% cover), internally drained and seasonally flooded, hard bottomed playas within an elevational band between 2,500 and 5,000 feet. Waterfowl are believed to aid in seed dispersal. Playa surveys in recent years have added considerably to the knowledge of this species' range. These playas are widely distributed in the range of *L. davisii* but are infrequent and are disappearing rapidly. Playas become unsuitable habitat if they are compacted (as happens when livestock congregate there), disturbed by OHV traffic (a common occurrence), or are invaded by exotic plant species (attributable to several causes). Several populations have been lost in the last two decades from reservoir development and the increase in range fire frequency. Overall, this species is in marked decline, especially in the portion of its range north of the Snake River. Monitoring of this species is ongoing at Mountain Home Air Force Base (Bernatas and Moseley 1991). A BLM Conservation Agreement signed with the USFWS in 1995 protects sites on the Vale and Burns Districts, Oregon.

*Lepidium papilliferum* (Henderson) A. Nelson & J.F. McBride is a regional endemic native to the Snake River Plains of southwestern Idaho. Like *L. davisii*, this species' preferred habitat is the bottom of small, internally drained playas (slick spots). *L. papilliferum* occasionally occurs

with *Texosporium sancti-jacobi*. This species is in decline throughout its range due to many threats, especially land development, livestock grazing (most through the action of trampling and soil disturbance in the slick spots), and exotic plant species (that both invade the disturbed slick spots and have increased the historic fire frequency). There are populations of *L. papilliferum* on the military training range south of Boise, Idaho that are threatened by tank traffic. Both the Boise District BLM and the Army National Guard are currently involved in monitoring and population genetics studies of *L. papilliferum* and the most recent status survey for this species is Moseley (1994).

*Leptodactylon glabrum* Patterson & Yoder-Williams is a local endemic native to the canyons of southwestern Idaho and adjacent northern Nevada. It prefers to grow on rhyolitic cliff faces and overhangs within an elevational range of 3,300 and 4,500 feet. This species is currently being monitored in the Bruneau River Canyon of southern Idaho. Though nearly nothing is known about this species' biology, there seems to be no significant discernible threats. If there were hydrological developments in the Bruneau River Canyon a significant proportion of this species could be lost.

*Leptodactylon pungens* (Torrey) Nutt. ssp. *hazeliae* Meinke is a local endemic restricted to south and west aspect vertical basalt cliff faces in the middle Snake (Hells Canyon) and lower Salmon River corridors at elevations between 975 and 2,000 feet. Populations of this species appear to be stable though some losses occurred in the past when the reservoirs on the Snake River were filled. Seedling establishment has never been observed. Most of the known populations are near popular trails or roads and thus may be threatened by maintenance activities. Today, the only significant threat to this species is drift from herbicide spraying to control noxious weeds (especially yellow starthistle, *Centaurea solstitialis*).

*Lesquerella carinata* Rollins var. *carinata* is a regional endemic known from the Lemhi and Lost River Ranges in Idaho and Teton County, Wyoming. It prefers rocky foothill slopes and ridges of limestone, slate and shale and the gravel of sparsely vegetated slopes and ridgecrests in the mountains at elevations between 6,500 and 8,500 feet. The vegetation at *L. carinata* sites is typically low. Though this species is often found on calcareous substrates it is not restricted to such sites. *L. carinata* is fairly common within its range.

*Lesquerella carinata* Rollins var. *languida* Rollins is a local endemic restricted to the Garnet Range in west-central Montana. This newly described variety (Rollins 1993) is currently known from four occurrences, all in Granite County, and the total known occupied area is about 200 acres (Vanderhorst 1995). It is confined to substrates derived from the Mission Canyon limestone of the Madison group (Schassberger 1991), and at least much of its range is confined to a zone of high calcium limestone. It grows in loose, gravelly soils, usually on steep, southerly exposed slopes with a hot, dry microclimate. It occurs in the ponderosa pine zone, in open woodlands, bitterbrush shrublands, grasslands, and on barren scree slopes. The taxon is insect-pollinated and primarily outcrossing, although selfing has been detected (Greenlee 1994). Evidence of a seed bank was found in monitoring transects at one site, where over twice as many seedlings were born in 1993 as the number of seeds calculated to have been produce in the plots in 1992 (Greenlee 1994). Populations of *Lesquerella carinata* var. *languida* are capable of high

levels of reproduction but may also be subject to high mortality. The populations may go through boom/bust cycles, with high seedling establishment, low mortality, and high population growth rates in favorable (moist) years, but few seedlings, high mortality, and population decline in stressful (dry) years (Greenlee 1994). The primary threat to populations is invasion by spotted knapweed, which has been shown to negatively impact growth and survival (Greenlee 1994). Removal of knapweed from experimental plots increased vigor and, most importantly, adult survivorship. Damage by aerial herbicide spraying and cattle trampling has also been observed (Achuff and Roe 1992; Schassberger 1991). Also, adults and seedlings were found to have a positive spatial relationship with bunchgrasses at a relatively hot, dry site; the taxon appears to use bunchgrasses as nurse plants in stressful years, but not in less stressful years (Greenlee and Calloway in prep.; Greenlee 1994). This taxon is currently proposed by the Bureau of Land Management for sensitive status on such lands in Montana (USDI Bureau of Land Management 1993), but no management policy or plan is currently in place for it. It has been recommended that this taxa be changed to a Category 1 federal candidate, owing to its limited range and threats from invasion of spotted knapweed (Vanderhorst 1995).

*Lesquerella humilis* Rollins is a local endemic, narrowly restricted to four small occurrences in the Bitterroot Mountains in Ravalli County, Montana. This species is one of the rarest plants in Montana, with approximately 2,500 to 3,000 individuals observed during the course of recent surveys (Montana Natural Heritage Program database records, Helena). It occurs at elevations from 6,900 to 9,587 feet, in krummholz stands of *Pinus albicaulis*, and in open, windswept alpine areas (Lesica and Shelly 1991; Shelly 1988). As with many taxa in the genus *Lesquerella*, it occurs in open, rocky substrates, in this case on metamorphic substrates influenced by granitic intrusions. These metamorphic rocks, mostly gneiss and schist, were locally penetrated by granite in the northern portion of the Bitterroot Mountains, and the rocks are reddish-orange in color; thus, the species appears to be edaphically restricted to this area of unusual bedrock geology (Shelly 1988). While the majority of the species' range lies within or on the border of the Selway-Bitterroot Wilderness Area, it is of conservation concern owing to its rarity. One occurrence is being impacted by recreational use, as a popular hiking trail traverses a portion of the occupied habitat (Achuff 1990; Shelly 1988). A small portion of a recently discovered population occurs in an area disturbed during the construction of a dam, but the majority of this occurrence is in undisturbed, native habitat (Montana Natural Heritage Program database records, Helena). Intensive surveys on adjacent summits, and throughout the Bitterroot Range, have failed to locate any additional populations (Achuff 1990; Shelly 1988). A species management plan should be prepared for this taxon.

*Lesquerella paysonii* Rollins is a regional endemic, currently known to occur in Idaho, Wyoming and southwest Montana. This species occurs on barren, rocky slopes and ridgelines at elevations between 6,300 and 10,000 feet. Its preferred substrates are gravely and calcareous though it is also known from talus, residuum, and areas of mass wasting. The known range of this taxa has been greatly expanded in the last five years due to greater survey intensity in western Wyoming, where populations in Wyoming are more abundant than in southeastern Idaho. The taxonomic disposition of the single occurrence suspected in Montana is currently being reevaluated, but is likely to be this species (B. Heidel, pers. comm.). Invasion by spotted knapweed is occurring along the lower slopes at this site, but has not seriously spread into the

majority of the habitat. Light grazing of the associated grasslands has occurred in the past, but does not seem to have adversely affected much of the population. The area where *L. paysonii* occurs has been proposed as a Botanical Special Interest Area by the Deerlodge National Forest; if this designation is completed, a management plan should be developed for the area and the rare species that occur there, including *L. paysonii*. Oil and gas exploration, mining and the invasion of noxious weeds are threats to this species.

*Lesquerella* sp. novum ("*pulchella*") is a regional endemic in southwest Montana. It is currently known from seven sites in Beaverhead County, at elevations from 6,320 to 9,600 feet in the Centennial and Pioneer mountain ranges (Heidel 1993). This taxon, which was previously thought to represent *L. carinata*, has been determined to represent a new, undescribed species by Dr. R.C. Rollins, Harvard University (Heidel 1993). Within its geographic range, it is nearly restricted to Madison Group limestone. It is further restricted to plant communities where groundcover is open and competition is reduced. Lower, foothills populations are in dry *Agropyron* spicatum communities or *Cercocarpus ledifolius* communities. Upper elevation populations are in dry grasslands or open parklands of *Pinus albicaulis* and *Abies lasiocarpa* on north and east aspects, extending down into *Pseudotsuga menziesii*-*Carex geyeri* association on south aspects (Heidel 1993). Three foothills sites are in grass-dominated communities grazed by livestock. While no plants appeared to be grazed, they are potentially affected by trampling by livestock. The upper-elevation sites in the Pioneer Mountains are in an area of concentrated mining activity, and active mines or mining claims are adjacent to five occurrences. Timber harvesting and weed invasion are not currently threatening the known occurrences (Heidel 1993). It is recommended that this taxon be designated as sensitive by both the USDA Forest Service and the USDI Bureau of Land Management (Heidel 1993).

*Limnanthes floccosa* How. ssp. *bellerigeriana* (Peck) Arroyo is a regional endemic found on volcanic plateaus in southern Jackson and Klamath Cos., Oregon, and in north central California. Twenty-six occurrences are reported from BLM and private lands in Oregon, with the greatest concentrations found near the rim of the Klamath River Canyon. Seven of the 15 Oregon records are of the populations are within the ICBEMP assessment boundary. Subspecies *bellerigeriana* is found in moist meadows and vernal pool habitats, in intermittently wet, stony flats. Soils range from extremely stony or gravelly loams to clay loams. Soil permeability is low in some sites, resulting in seasonal ponding within microtopographic depressions. Sites in Oregon are on level or moderately sloping ground at elevations between 1800 and 4200 feet. All reported sites occur within or adjacent to open coniferous forest dominated by *Pinus ponderosa*, often in association with *Quercus garryana*. Adequate moisture from winter and spring precipitation is required for successful fruit production, and for fall seed germination. A facultatively autogamous annual species, *L. floccosa* ssp. *bellerigeriana* generally drops its seed in the immediate vicinity of the parent plant, although some seed may be dispersed by rodents or large herbivores. Potential threats to the species include catastrophic fire, grazing, trampling and soil compaction due to livestock activity, and timber harvest activity, including skidding and site preparation. Population trends are unknown at this time. A BLM Conservation Strategy for populations in Oregon is in preparation (1995).

*Lomatium erythrocarpum* Meinke and Const. is a small, highly restricted local endemic. Six occurrences (Brooks 1995) are known from the Elkhorn Mountains of Baker County in Northeast Oregon. It is found between 7,000 and 8,500 feet in elevation on steep, dry, south slopes. It is found on alpine and subalpine barrens, gravelly granodiorite soils and argillite talus. Less typically it can be found on limestone substrates (Brooks 1995). It tends to grow on the ecotone between the shrub-steppe and subalpine woodland (Meinke and Constance 1984) or among whitebark pine with a canopy cover less than 20%. It frequently grows in association with *Polygonum phytolaccaefolium*, and high elevation stands of *Cercocarpus ledifolius* and *Artemisia tridentata*. This geographically restricted, high elevation species is threatened by global warming, as refugia are limited. If populations of mountain goats in the Elkhorn Mountains increase dramatically their foraging and trailing activities could be an impact.

*Lomatium greenmanii* Mathias is a local endemic species. It is only known from two occurrences, on Mount Howard and Ruby Peak in the Wallowa Mountains, Wallow County, Oregon. It is found between 7,500 and 9,000 feet in elevation, mostly on a coarse substrate of fractured basalt altered to greenstone, and influenced by adjacent Hurwall limestone formations. *L. greenmanii* inhabits ridgetops and low to moderate slopes on alpine scree, barrens, and turf. Occasionally it is found among sparse whitebark pine parklands. Primary associated species include *Eriogonum ovalifolium* ssp. *depressum*, *Castilleja chrysantha*, and *Trisetum spicatum* (Kagan 1987b). Its mountain top habitat makes this parsley vulnerable to global warming. The Mount Howard population is situated among a network of trails fed by a tourist tramway, where an average of 25,00 people per season visit this location each summer (Hustafa 1995). There are significant threats at this site from trail deterioration, trail maintenance and trampling from off-trail hikers. Recent efforts to modify and control the pattern of use has been met with limited success. Monitoring of this species, initiated in 1992 by the Oregon Department of Agriculture should indicate whether the populations on Mount Howard are in decline or stable.

*Lomatium ochocense* Helliwell and Constance, is a very restricted local endemic that was discovered in 1994. Currently it is known from one occurrence (population) on the Ochoco National Forest and four occurrences on the Prineville District of the BLM in the Ochoco Mountains of Crook County, Oregon along the North Fork of the Crooked River. It has been found between 1300 and 1400 meters in elevation, on basalt scablands (tablelands). In 1995, populations ranged from 25 to 10,000 individuals. It grows on shallow basalt lithosolic soils classified as Clayey-skeletal, frigid Argixerols. Here it is restricted to terrain where there is exposed fractured bedrock (Picture Gorge formation) supporting an *Artemisia rigida*/*Poa sandbergii* plant association (Helliwell & Constance 1995). In addition, *Oryzopsis hendersonii* was found at the Type location as well as four other *Lomatium* species. It is currently being submitted for publication (Helliwell & Constance 1995).

*Lomatium suksdorfii* (S. Wats.) Coult. & Rose is a regional endemic of the Columbia River Gorge portion of the East Cascades. It is known from five occurrences in Hood River and Wasco Counties, Oregon, and from Klickitat County in the Klickitat and White Salmon River drainages in Washington with the largest population in Oregon in private ownership. Approximately half of the 23 occurrences in Washington are on public land in the Columbia River Basin Province. Populations usually consist of several hundred individuals. The species is found growing on

exposed, rocky, steep to shallow slopes supporting *Quercus garryana*, and often *Pinus ponderosa* and *Juniperus occidentalis* woodlands. Common herbaceous associates are *Agropyron spicatum* and *Balsamorhiza sagittata*. Substrates include poorly developed mineral soils, sands, and loams, with a fair amount of rock on the surface and basalt outcrops; but not on ridgelines or in draw bottoms. Aspects vary from northwest to southeast. It ranges in elevation from 120 to 3600 ft. While *L. suksdorfii*'s persistence on these xeric substrates is likely aided by a deeply-rooted habit, grazing and associated increases in weedy annuals may be negatively impacting seedling recruitment at some sites. Urban development and threats posed to potential lepidopteran pollinators by BT spraying have also been suggested for populations in Washington (J. Gammon, pers. comm.). Fruits are large, and dispersal mechanisms are not well understood. Population trends are unknown. Mining is also a threat.

***Lomatium tuberosum* Hoover** is a local endemic to Yakima, Grant, Kittitas, and Benton Counties, Washington. In the Columbia River Basin Province, 14 of the 24 occurrences in Washington are on private land. Populations usually consist of several hundred plants. It grows on unstabilized basaltic talus among shrub-steppe vegetation on 15 to 90 percent slopes. It ranges from 460 to 4000 ft. in elevation. Although the tuberos root of this perennial is eaten by Native Americans, it is not a major food source. It also provides food for small animals.

***Luina serpentina* Cronq.** is a highly restricted local endemic, known from 18 occurrences in the Aldrich Mountains of Grant county, Oregon. This stout perennial inhabits moderate to steep serpentine slopes such as those found along Fields Creek. It is found at sites between 3,300 and 5,900 feet in elevation, on talus slopes in openings among the surrounding ponderosa pine forest. *Luina serpentina* is pollinated by butterflies and in its sparse habitat, it appears to be an important local source of nectar for these insects. However studies have found that there is very little genetic variation among populations and almost all seeds are sterile. This poor seed set, in addition to being geographically and edaphically restricted to high elevations in the Aldrich Mountains, make this species easily threatened by habitat disrupting events such as global warming and ground disturbing management actions.

***Lupinus biddlei* Hend. ex C.P. Smith** is a regional endemic, found in the Great Basin and Owyhee Uplands physiographic provinces. It is known from thirty-two occurrences in Harney and Malheur Counties, Oregon. One occurrence is reported from Wheeler Co., Oregon, in the High Lava Plains province. *Lupinus biddlei* has recently been subsumed under *L. polyphyllus* by Barneby (1989). Two flowering forms, a white- and blue-flowered morphology, have been identified. *Lupinus biddlei*, the white-flowered form from Harney Co. and an adjacent site at Warm Springs Reservoir in Malheur Co. is not sympatric with the more common blue flowered form. Further study is required to determine whether the white-flowered form deserves special taxonomic status. The species is found on a variety of soil types including alluvial, aeolian, clayey-sedimentary soils, and soils derived from basalt. Major associates include *Agropyron spicatum*, *Poa sandbergii*, and *Artemisia tridentata*. The species grows on low hills, slopes and flats. Number of individuals within a given population, and percent of those flowering, varies with annual precipitation. Population trends are considered stable. The species is able to survive fire, but seedling recruitment may be inhibited by cheatgrass invasion. Individuals have been found growing in areas seeded with crested wheatgrass, however. Grazing and mining are

threats, especially with respect to their impact on plant community composition. The species is found at the proposed Grassy Mountain Gold Mine, south of Vale.

*Lupinus cusickii* Wats. is a local endemic, known from one occurrence in Baker County, Oregon, near Unity Reservoir. It is found on clay and volcanic ash (pluvial lake ash sediments). This lupine grows in basins, drainage channels, and along the toe and mid slope between 3,800 and 4,000 feet in elevation. It inhabits terrain associated with juniper, sagebrush, bunchgrass and occasionally squaw apple. *Lupinus cusickii* is being impacted by off-road vehicle use and to a lesser degree, livestock trampling.

*Meconella oregana* Nutt. in T. & G. has a scattered distribution in Washington and Oregon. It ranges west of the Cascades Mountains from southern British Columbia south to California. In the Columbia River Basin Province, it is known from three occurrences in Klickitat County, all on National Forest Service land along the Columbia River Gorge from 200 to 1000 ft. in elevation. It occurs in openings with *Agropyron spicatum* in the *Quercus garryana* and *Pinus ponderosa* zone on slopes and ridgetops. One population of this annual included several hundred plants. Winter and spring moisture are important, but sites dry out by early summer. The greatest threats are increases in annual exotics, changes in species composition from grazing, and changes in hydrologic regimes. This plant is only visible for a week and is very small, thus making surveying difficult.

*Mentzelia mollis* M.E. Peck is a regionally endemic annual found in ash beds of the Owyhee Uplands of eastern Oregon and adjacent southwestern Idaho, and in Nevada in the Black Rock Desert. It is known in Oregon from eighteen occurrences in Malheur Co., specifically on Succor Creek and Leslie Gulch ash that has been weathered to montmorillonite (ash containing bentonite and montmorillonite) that decompose to clays (e.g., the Succor Creek formation). Suitable ashbeds occur at elevations between 2,500 and 4,800 ft. and typically have less than 15% vegetative cover. At least two sites are known to be on private land. Substrates are characterized by a high concentration of calcium, sodium and potassium ions. The timing of precipitation is key to the growth of *M. mollis*, and individuals establish within cracks in the drying clay where water availability is greatest. Communities are composed primarily of annuals, and cover is generally sparse. Associates include *Cleome platycaule*, *Phacelia lutea*, *Sitanion hystrix*, and *Artemisia tridentata* and *Chrysothamnus nauseosus* in low frequencies. Several populations of this species have been lost to mining activities and many sites have been severely degraded by livestock trampling and invasion by exotic plant species. Range improvements (such as seeding) and OHVs are also responsible for the degradation of several *M. mollis* sites. Livestock grazing and invasion of sites by exotics are threats, especially during wet years. Introduced annuals, notably yellow star thistle (*Centaurea solstitialis*) and whitetop (*Cardaria draba*) may be abundant, and whitetop encroachment has been observed at one fenced site. Fire suppression efforts have resulted in mechanical disturbance of some sites.

*Mentzelia packardiae* Glad. is a regional endemic, known from thirteen occurrences on the Leslie Gulch ash flow in Malheur Co., Oregon, and from one site in northern Nevada that is thought to have been extirpated. Inventory for the species is believed to be generally complete.

The species has not been found west of the Owyhee Reservoir, nor has it been located at Succor Creek. At Leslie Gulch the species grows on the Spring Creek tuff unit, on yellow-green, gravelly talus ash hydrothermally altered welded tuffs at elevations below 5,600 ft in soils that are zeolite clay-rich and have a high potassium content. *Senecio erterae*, and occasionally *Eriogonum novonudum*, are associates. *Atriplex confertifolia* and *Agropyron spicatum* have encroached onto one of the sites, displacing some individuals of *M. packardiae*. Grazing has been identified as a threat as a decrease in *M. packardiae* has been observed where individuals are concentrated at toeslopes, in areas where cattle graze and trample the soil. Competition with exotics (especially *Bromus tectorum* and *Lepidium perfoliatum*), fire suppression activities, exotic plant species OHVs, and range improvements appear to be significant threats to the viability of this species in Nevada. The ash contains zeolites (Grimes 1984), but mining claims on occupied sites have been abolished. High recreation use in Leslie Gulch has resulted in some sites having been trampled by visitors. A BLM-USFWS Conservation Agreement established for Leslie Gulch protects known sites in Oregon. The range of *M. packardiae* has been thoroughly inventoried and the species is currently in decline.

*Mimulus ampliatus* Grant (= *M. washingtonensis* Gand. ssp. *ampliatus* (Grant) Meinke) is regional endemic that has been infrequently collected. It is probably much rarer and more vulnerable than *Mimulus washingtonensis*. It is suspected to occur in Wallowa County, Washington, though it is currently known only from Nez Perce, Idaho, and Lewis Counties, Idaho (Meinke 1995). Populations require vernal moisture but other habitat requirements are not understood. Populations trends for this taxa are unknown.

*Mimulus clivicola* Greenm. is a regional endemic, from Idaho, Washington and Oregon. In the Blue Mountain Province, this diminutive spring annual is known from 18 occurrences in Baker and Wallowa Counties of northeast Oregon, and approximately one hundred occurrences in ten northern and central Idaho counties. In the Blue Mountain Province it is found between 2,500 and 5,800 feet in elevation, on open mineral soil such as loose, basalt derived sand or fine gravel slopes, or rocky, talus outcrops on all but due north aspects. These openings appear to be shallow soiled, sparsely vegetated areas among a matrix of bunchgrass slopes, snowberry shrub-fields, and stringers of ponderosa pine timber. *M. clivicola* appears to prefer the more mesic microsites among terrain occasionally shared with *M. nanus*. Frequently populations in Hells Canyon National Recreation Area, are associated with *Cammassia cusickii* on moderate slopes. It is likely pollinated by ants (Lorain 1991) and small flies (Hustafa 1995). This species appears to have complex seed bank biology, as it exhibits erratic population fluctuations in flowering individuals in relation to annual weather conditions (Lorain 1991). *Mimulus clivicola* habitat is threatened by log decking and disturbances from livestock trampling and trailing that are greater than the historical levels associated with deer and elk travel. Habitat degradation that results in weed invasion also threatens this species. There are no specific studies that accurately reflect the long-term population trends of this taxa.

*Mimulus evanescens* Meinke is a newly described regional endemic of mid-elevation riparian sites in the Great Basin. Historically the plant occurred from SW Idaho to NE California but is currently known only from two extant populations, one near Drews Reservoir in Lake Co., Oregon, and one in Lassen Co., California. The population in California has been extant for at

least six years, while the one in Oregon has only recently been discovered. Occurrence of this autogamous annual species is highly correlated with ephemeral moist sites, including perennial and intermittent streams and receding margins of lakes, ponds and reservoirs. Sites range from approximately 3600 to 5400 feet in elevation and are found within the sagebrush-juniper vegetation zone. Substrates include muds and gravelly to rocky basaltic sands. Associated species include *Artemisia tridentata*, *Juniperus occidentalis*, *Mimulus floribundus*, *M. suksdorfii*, *Porterella carnosula*, *Collinsia grandiflora*, *C. parviflora*, *Downingia* sp., *Mimetanthe pilosa*, and *Heterocodon rariflorum* (Meinke 1995). Fall and winter precipitation is important for germination and reproduction. Seeds are dispersed by flowing water, wind and gravity. Dormancy is interrupted by cool moist stratification or, to a lesser degree, time. Reproduction may be precocious in response to drought. Population trends of this species are unknown. Significant changes in reservoir water levels is a potential threat, as a population may need to migrate into the sagebrush zone where competition with exotic annuals is high. Habitat alteration by livestock is also a potential threat. This plant is considered extremely rare and vulnerable throughout its range (Meinke 1995).

*Mimulus hymenophyllus* Meinke is a narrowly local endemic and is found in and west of Hell's Canyon to the Grande Ronde River in eastern Oregon and one historic collection at Pittsburg Landing in western Idaho. It occurs only on rock walls and steep, vertical, shaded cliffs above shrub thickets (predominantly *Physocarpus*, *Amelanchier*, *Ribes*, and *Rosa*) in steep draws along perennial cold water creeks. It is often associated with species of *Arabis*, *Bolandra*, *Heuchera*, *Penstemon*, *Saxifraga*, *Sedum*, *Selaginella*, *Stellaria*, *Thelypodium*, *Tonella*, *Viola*, and a variety of ferns and bryophytes. The Pittsburg Landing site in Idaho is atypical for *M. hymenophyllus* and is heavily altered by intense cattle grazing. *M. hymenophyllus* is not currently directly threatened by human activities however, overstory removal and hydrological changes could seriously harm known populations.

*Mimulus jungermannioides* Suksd. is a regional endemic known from Washington and Oregon. The one occurrence in Klickitat County from the Columbia River Gorge National Scenic Area is thought to be extirpated. It is also known from 13 sites in Gilliam, Sherman, Umatilla Counties, and four occurrences in Wasco Co., Oregon. In Umatilla County it is on private land. It requires perennial seepage and grows from 150 to 1000 ft. in elevation. The species is typically found growing on shaded vertical basaltic and limestone cliff crevices and overhangs in riverine canyons, or stream bank areas or washes where ground water seeps and perched water tables maintain a moist substrate. A highly specialized, largely clonal species, *M. jungermannioides* is unique in that regeneration usually results from subterranean bulb-like turions arising at the end of negatively-phototropic stolons produced annually in the late summer and fall. Flowers are pollinated by small bees or are autogamous, and although seeds are plentiful, viable, and germinate easily, establishment of sexually developed plants is rarely observed. Preliminary molecular and morphological evidence from a study in progress at Oregon State University, funded by the Prineville BLM, suggests that clonal growth in *M. jungermannioides* may be responsible, at least in part, for local genetic fixation (R. Meinke, pers. comm.). The dependence of this cliff obligate species upon perennial seeps suggests that the maintenance of an available water supply is critical to population viability. Significant threats include fire, blasting of cliffs for road construction, spray drift from roadside weed control and development. The species is

currently considered stable throughout its range, though opportunities for population expansion are extremely limited. This species may represent a remnant of a pre-Hypsithermal plant community, adapted to a much wetter overall climate, that retreated to dripping cliffs as the CRB became more arid in the Holocene.

*Mimulus patulus* Pennell is a local endemic known from the Oregon portion of the Hell's Canyon NRA and extreme northeastern Oregon (Wallowa County). Historic collections from this species have been made from extreme southeast Washington and adjacent Idaho, where it may possibly still exist, though many of the historic sites are now under water from Snake River impoundments. This species is similar in appearance to *M. hymenophyllus*, *M. washingtonensis*, and *M. guttatus*. This species is suspected, but not known, to occur in Idaho. *M. patulus* occurs on damp ground, cliffs, and roadcuts in the mosaic of bunchgrass and/or sparse conifer stands along the northeast slope of the Wallowa Mountains uplands. These moist microsites of basalt substrate are often located with various species of *Astragalus*, *Lomatium*, *Allium*, and *Delphinium*, usually with a significant weedy component dominated by annual bromes and fescues.

*Mimulus pygmaeus* Grant is a regional endemic of the Klamath River Basin, in the southern end of the East Cascades physiographic province. It is known from twenty-seven occurrences in southern Klamath and Lake Cos. and the eastern margin of Jackson Co., Oregon, with a site near Thompson Reservoir representing the northernmost population. Occurrence of this reproductively precocious annual is correlated with vernal moist, poor to moderately-drained sites characterized by heavy, ash-clay soils. Almost all occurrences are known from USFS and BLM land, and in wet years flowering plants are prolific and recent studies (Meinke et. al. 1993) indicate that this species may actually be widespread and locally common in wet years in south central Oregon. The species is often found within a narrow ecotone between wet meadow and *Artemisia* zones, in open areas of *Artemisia arbuscula* scrub communities, or within the high water zone of perennial streams. *M. pygmaeus* is a short-lived self-pollinator with an extensive seed bank. When in fruit, mature capsules tend to persist on the stem, and so the entire plant may act as a dispersal unit. Dihescence and dispersal are by water, as capsules must soak prior to releasing seeds. Fire and scouring by spring floods may play a role in maintaining shrub openings favorable to species viability. A conservation strategy (Meinke 1994) is in effect for the Winema and Fremont National Forests. The population trends for this taxa are unknown as the seed bank biology is not fully known.

*Mimulus washingtonensis* Gand. var. *washingtonensis* is a regional endemic of the Blue Mountains and High Lava Plains provinces of Oregon and from southeastern Washington in the Columbia Gorge, where it is known from one site at 3500 ft. in elevation in a wet seep along a steep intermittent stream with slopes of 20 to 75% on a southern aspect on basalt. This plant also occurs in Idaho. In Oregon the largest number of occurrences (317) are in the John Day Basin of Wheeler and Grant Counties (25 on Prineville BLM) from two new occurrences in Crook County (R. Halverson, pers. comm.), and 19 occurrences in Morrow Co. (Urban 1995). This species is edaphically limited to metamorphosed volcanic soils comprised of weathered tuffaceous sediments derived from John Day Buff formations. It has been found between 2,000 and 4,000 feet in elevation. Occurrence of this annual is correlated with ephemeral or perennial

rivulets and seeps on shallow basaltic scree and gravelly soils over bedrock, and may be locally abundant in wet years. Plant cover is commonly low (<5%) and sites are devoid of associated vegetation. Sites are nitrogen-limited and a species of *Nostoc* (cyanobacteria) is a common associate that may compensate for the lack of available soil nitrogen. As with other annual members of the *Mimulus* genus, sufficient precipitation is needed during the fall and winter months to maintain hydrologic site characteristics and to facilitate germination. It inhabits seasonally moist patches and seepage areas in otherwise dry, open, highly erodible soils. Its seed bank biology is not well understood and enormous fluctuations in populations size are observed between dry and moist years. Populations are rare or absent during drought years, but are considered stable overall. Livestock trampling is a minor threat. In Washington, timber harvest and road building would adversely impact known populations. It is also threatened by the invasion of exotic grass species, especially annual bromes, which displace this sensitive species. Where *Mimulus guttatus* shares disturbed sites with *M. washingtonensis* var. *washingtonensis*, the latter shows evidence of depressed seed set due to shared pollinators and contamination of the stigmas.

*Mirabilis bigelovii* Gray var. *retrorsa* (Heller) Munz is a disjunct endemic known from Harney and Malheur Counties, Oregon, and from California, Nevada, Utah, Arizona and northwest Mexico. It occurs in Oregon on barren basalt outcrops and talus slopes, including sites near Owyhee Reservoir and Alvord Lake, at elevations between 2500' and 2800'. Inventories have not yet been completed for the species, but within its range the highest population concentrations are found in California. Potential threats to the species include establishment of gravel pits within its habitat. Population trends are considered stable.

*Mirabilis macfarlanei* Constance & Rollins is a listed threatened species and an endemic found in the mid and lower Snake River and lower Salmon River canyons. It prefers sites with full exposure though it occurs on a variety of aspects and slope positions at elevations between 1,000 and 2,800 feet. It can be found on a variety of substrates ranging from deep loamy to rocky loam soils, to rocky talus or fine gravelly and sandy basalt soils. The most notable associated vegetation includes *Agropyron spicatum* on the better sites and *Asclepias cryptoceras* on some of the sparsely vegetated basalt gravel sites. This perennial grows from a deep-seated tuberous root that can send out several rhizomes to form large intermingled clones. Winter and early spring rainfall significantly affects plant vigor. Direct and indirect impacts of livestock grazing (including the introduction of exotic plant species) have significantly altered the habitat of this species in the past. Most *M. macfarlanei* sites have cheatgrass (*Bromus tectorum*), knapweeds (*Centaurea* spp.), and yellow starthistle (*Centaurea solstitialis*). The threat from exotics plants is due to both direct habitat conversion and herbicide use. Today, livestock grazing is still considered to effect populations of *M. macfarlanei* but the impact of this activity varies greatly with the season. Population trends for this species are unclear. While ongoing surveys have located additional populations, no one has yet observed a seedling in the field. *M. macfarlanei* is the host for a rare leaf mining moth's larvae, *Lithariapteryx* sp. nov. (Baker 1985). The BLM has been monitoring some populations of this for 15 years and there is an ongoing research project (Barnes and Wolf 1994) at Utah State University investigating inter- and intrapopulation genetic variability.

*Musineon lineare* (Rydberg) is a disjunct species known in Idaho only from the Bloomington Lake cirque in the Bear River Range (Moseley, 1992). The main body of this species range is in central Utah. That population of approximately 200 individuals occurs at 8,800 feet in scree and rocky outcrops on the northwest face of the cirque. This species appears to be well protected at this site.

*Oenothera psammophila* (A. Nelson & J.F. McBride) W.L. Wagner, Stockhouse, & Klein is a local endemic restricted to the drifting St. Anthony sand dunes of Fremont County, Idaho. This species tends to colonize the trailing edges of the dunes where bedrock (basalt) is within one meter of the surface. The major threat to the viability of populations of *O. psammophila* is OHVs. The BLM is currently drafting a conservation strategy for this species. Populations trends for this species are considered stable.

*Oryzopsis contracta* (Johnson) Shechter is a scattered endemic from the Wyoming Basin from Beaverhead County, Montana into northern Colorado. It is known from a limited number of sites within the assessment area, which are at the periphery of the species' range. It occupies a broad range of soil types and aspects in sagebrush grasslands at elevations between 4,800 and 7,800 feet. This species is threatened by high grazing pressure and some sites may be threatened by habitat conversion. Surveys in recent years have identified many new sites and the panel suggested that 3C might be a more appropriate Federal status than C2.

*Oryzopsis (Achnatherum) hendersonii* Vasey is a regional endemic found in Yakima and Kittitas Counties in Washington and Wasco and Crook Counties, Oregon on shallow lithosolic substrates or welded tuffs in open habitat within a matrix of ponderosa pine and bunchgrass stands. It prefers gentle slopes or level ground with soils containing a high levels of weathered basalt gravel and rock, basaltic scablands and frost-heaved soils, with stone stripes and net patterns. It is reported to be associated with *Poa secunda*, *Artemisia rigida*, *Eriogonum strictum*, and *E. douglasii* species on scablands (Vrillakas 1990). Populations of this strongly tufted perennial grass are small and scattered. Elevations range from 2200 to 5400 feet in elevation. Significant threats to the viability of *O. hendersonii* populations include livestock trampling, grazing and trailing, salt blocking, the invasion of exotic plant species, road construction and OHV traffic.

*Oryzopsis (Achnatherum) wallowensis* Maze and K.A. Robson is a regional endemic currently being proposed as a new species by Jack Maze and Kali Robson, University of British Columbia. It is primarily found in Wallowa County, Oregon with a few populations known from the north slope of the Ochoco Mountains, in Crook County (Maze 1995). Occurrences for this species of *Oryzopsis* are likely mixed in with reports for *O. hendersonii*. It differs prominently from *O. hendersonii* in its drooping inflorescence. Although other morphological differences exists, its habitat affinity is sympatric with that described for *O. hendersonii*. Both species face similar threats.

*Oxytropis campestris* (L.) DC. var. *columbiana* (St. John) Barneby is a regional endemic in the Pacific Northwest. The taxonomic disposition of this variety has been the subject of uncertainty, based on varying opinions of systematists who have examined specimens from

Montana; this situation is summarized by Lesica (1992). Until such time as further taxonomic work is completed, in the interest of conserving biological diversity the taxon has been nominated for Category 2 candidate status. The habitat for this taxon consists of gravel shores and river bars that are subject to wave action (Lesica 1992). In northwest Montana, six occurrences have been documented on the shores of Flathead Lake in Lake County. In addition, 13 sites were located along the North Fork Flathead River in Flathead County; however, these populations appear to be intermediate, both in morphology and habitat, between varieties *columbiana* and *gracilis* (Lesica 1992). *Oxytropis campestris* var. *columbiana* is also known from northeast Washington, from gravelly banks along the Columbia River, but these populations are believed to have been mostly extirpated by habitat destruction as a result of the construction of Grand Coulee Dam. The habitat on Flathead Lake in Montana is threatened by residential development, and possibly also lake level regulation (Hungry Horse and Kerr dams) and invasion by spotted knapweed (Lesica 1992). Molecular systematic studies would be useful in clarifying the taxonomic status of this variety; in the interim, Category 2 candidate status is deemed appropriate.

*Oxytropis campestris* (L.) DC. var. *wanapum* Joyal is a local endemic to Grant County, Washington. The single occurrence of this recently described species is on federal land. This perennial grows on ridges and adjacent north-facing slopes on fine, sandy, and coarse-grained soil. Documented threats to this species and its habitat include exotic weed invasion and recreation. Population trends for *O. campestris wanapum* are unknown.

*Papaver pygmaeum* Rydb. is a regional endemic known to occur in northwest Montana, and in southern Alberta and British Columbia, Canada (Lesica and Shelly 1991). It is documented from nine locations in Montana (Montana Natural Heritage Program database records, Helena), in Flathead and Glacier counties, but is reported to be "locally common at many locations in Glacier National Park" (Lesica and Shelly 1991). It occurs in the Flathead, Lewis and Livingston mountain ranges. The habitat of the species consists of open, stony soil on gentle slopes and ridge tops in the alpine zone, at approximate elevations of 7,200 to 8,200 feet (Lesica and Shelly 1991). Although frequent in this geographic area, population sizes are small, and demographic population monitoring is advised to assess population stability (Montana VP panel notes). The taxonomic disposition of this species has been questioned; in an alternative treatment, Welsh et al. (1987) consider it a form of the widespread *P. radiculatum*, but this opinion is not universally held (Montana VP panel notes). Known populations are in well-protected or unthreatened areas, such as Glacier National Park.

*Parnassia kotzebuei* Cham. ex Spreng. var. *pumila* C. L. Hitchc. & Ownbey is a disjunct species known from the Cascade Mountains of Okanogan County in Washington. The center of this taxa's range is the mountains of British Columbia. The Okanogan site of five individuals is on National Forest Service land near the entrance of an active mine on copper ore bedrock and talus. It is on a north aspect on moist mossy ledges at the base of an overhanging granitic cliff on soil that does not dry out. The ground surface is 30 to 100% bare and slopes are 45 to 90%. This perennial plant is a Pleistocene relict. Significant threats include mining, landslides, change in fire regimes, grazing, development, and timber harvest. There is some uncertainty concerning the validity of the variety *pumila* among taxonomists; however, given the great extent of the

disjunction, this issue does not effect the Washington Natural Heritage Program's commitment to tracking this taxa.

*Penstemon barrettiae* Gray is a regional endemic to Klickitat County in Washington and adjacent Oregon. It is restricted in Washington to the Columbia Gorge and Klickitat River, where nine of 13 occurrences are on private land. This species inhabits fractured basalt cliffs and walls with limited annual seepage, rock outcrops and open talus with less than 30% canopy cover, and above the riparian vegetation of these major rivers. It is also found on cliffs within a matrix of xeric bunchgrass, shrub steppe and/or open canopied forest margins. Slopes vary from zero to 90%. *Penstemon barrettiae* occurs in the *Quercus garryana*/*Pinus ponderosa* zone up to 3200 ft. in elevation. The showy flowers are pollinated by large native bees, members of *Osmia* and *Bombus*, and fruit production is probably correlated with presence of these pollinators. Seeds are probably dispersed by wind and gravity, as no specialized dispersal mechanism is known. Although the range is well known, distributions within the range are not. Population trends are unknown, although rock gardeners and *Penstemon* horticultural specialists have extensively collected from wild populations in the past, depleting sites. The plant is readily propagated and is currently available at some nurseries. Hybridization of *P. barrettiae* with other species from similar habitat, including *P. fruticosus* has been noted. Significant threats include road construction and quarrying, collection, grazing, exotic weed invasion, and timber harvest. Damming of the Columbia River destroyed several populations.

*Penstemon compactus* (Keck) Crosswhite is a local endemic known only from federal lands in the Bear River Range, near the Utah border in Franklin County, Idaho. It is found on rocky, limestone or dolomite derived soils between 7,200 and 9,400 ft. Sites are in high elevation, subalpine ridges and open areas, upper slope and open rocky habitat of mountain big sage and Douglas fir parkland. There are eight sites in analysis area and, apparently, no immediate threats.

*Penstemon glaucinus* Penn. is a regional endemic of the Klamath River basin known from thirty-seven occurrences in Klamath and Lake Counties, Oregon. It is found in openings and in the understory of mid- to high elevation (5900-8400 feet) forests of *Pinus contorta*, *Pinus ponderosa*, *Pinus albicalus*, or *Tsuga mertensiana* composition. Soils are poorly developed and well-drained, usually of volcanic origin, shallow, often sandy-loamy, volcanic soil, sometimes along rocky points or ridgelines or occasionally in stony meadows. It is often associated with *Arctostaphylos*, *Holodiscus*, *Lomatium*, *Lupinus*, *Catilleja*, *Artemisia* and *Eriogonum*. Flowers are pollinated by members of the genera *Bombus* and *Osmia*. The species is found in communities of all successional stages, but is most abundant in early seral, post disturbance stands or stands that are naturally open. Though there are no long term data to evaluate persistence of populations in disturbed sites. A hardy perennial with extensive horizontal and vertical rhizomes, it is an early colonizer on old road beds and slash pile burns. Both fire and Silviculture prescriptions that decrease overstory cover may promote colonization. Populations reportedly spread once ground cover is removed (Vincent and Vincent 1980). Therefore, populations may be limited by fuel build up promoted by fire suppression. Fire also appears to scarify seed and thus facilitate germination. Seedlings are seldom observed, but large clonal patches are frequently found within the understory community. Population trends are considered

stable. A Conservation Strategy prepared for the Fremont National Forest (Wooley 1993) is in effect.

*Penstemon idahoensis* Atwood & Welsh is a local endemic inhabiting tuffaceous ash beds in the Goose Creek drainage. These sites tend to be relatively barren, having less than 10% cover. *P. lemhiensis* doesn't seem to have a preferred slope position though it is rarely found in drainage bottoms. The population trend of this species is unknown. Threats to local population viability include the invasion of exotic species, development, road construction, and herbicide spray and drift. Domestic livestock poses a threat to this species from trampling and indirectly by degrading upslope areas.

*Penstemon lemhiensis* (Keck) Keck and Cronq. is a regional endemic occurring in southwest Montana and adjacent east-central Idaho. The species primarily occurs in sagebrush-bunchgrass community types (*Artemisia tridentata*/*Agropyron spicatum*, and *Artemisia tridentata*/*Festuca idahoensis*), but is also known from low-elevation *Pinus ponderosa*/*Purshia tridentata* and higher elevation subalpine forb meadows and openings; occurrences span elevations from approximately 4,000 to 8,000 feet. Populations have been found on soils weathered from granite, limestone, and other rock types with textures generally being gravelly loams. This species is adapted to natural disturbance regimes and readily invades some types of openings. This broad range of habitats and elevations is unusual for a species of restricted geographic range, and is probably a result of the biogeographic divergence pattern in this group of *Penstemons*, as opposed to selection for adaptation to specialized habitats (Shelly 1990b). This and related *Penstemon* species have an apparently close pollination relationship with vespid wasps, though these wasps are not the only insect visitors (Shelly 1990b). The effects of fire suppression on the habitat and population dynamics of this species are not well-understood quantitatively, but it is highly likely that resultant vegetation succession, especially in sagebrush-bunchgrass habitats, has caused population declines (Shelly and Achuff 1992). Demographic monitoring studies at three locations in Montana revealed drastic declines in survival of established plants from 1989 to 1993, most probably as a result of prevailing drought conditions over the last eight years (Shelly 1990a; Shelly and Achuff 1992; Shelly and Heidel 1993). Although plants will grow in disturbed habitats such as roadbanks, they are never abundant in these situations, and these small ruderal populations do not contribute substantially to the long-term viability of the species. The average population size rangewide is small, with fewer than five populations that could be considered large, core populations (Shelly 1990b). Forest management practices of the last century, especially fire suppression and timber harvest, have caused a significant decline in the frequency of natural regeneration sites for this species. The invasion of exotic species and herbicide spraying are known to threaten some sites. This species is being cultivated for garden enthusiasts, primarily from commercially grown stock plants. A rangewide species conservation strategy is currently being completed.

*Penstemon "nikei"*. This unpublished epithet represents a series of populations with unique morphological traits, possibly related to *P. miser* Meinke unpubl. being tracked by the Vale District of the BLM (J. Findley, pers. comm.). Known only from Malheur County, OR in appropriate sites in the northeastern and east-central parts of the county. This edaphically restricted species has perhaps the most specialized habitat of all rare *Penstemons* in the CRB as it

occurs only on unique eroded clay/ash or diatomaceous substrates, within the sage scrub. The slopes are usually naturally barren due to the harshness of the physical environment. Additional inventory is a necessity and could be easily conducted using soil maps. Search should focus in Malheur County, Oregon and in appropriate areas of southern Idaho and northern Nevada. Mining and ORVs may be threats. Little is known about this plant and basic inventory and biological info is needed, substrate disturbance is a threat.

*Penstemon peckii* Penn. is a local endemic of the Metolius Basin, known from seventy-four occurrences in the southern East Cascades and High Lava Plains provinces, Jefferson and Deschutes Counties, Oregon. It is found at elevations between 2600 and 4000 feet in open, early to mid-seral *Pinus ponderosa* forests merging to the forest-meadow ecotone under an open or partially closed canopy of the dry meadow. Site topography is level to slightly inclined, and occasionally concave. Soils are deep, well-drained, gravelly-loam to rocky or sandy and of basaltic origin. Habitat occurs along recovering fluvial surfaces, streambanks, floodplain and sites characterized by at least vernal moisture. High soil moisture in the spring and summer is required for seedling germination and establishment. The species tolerates moderate disturbances and establishment may be facilitated by fire and silviculture prescriptions that open the canopy from below. Conversely, clearcuts and intensive site preparation have destroyed some populations. The infestation of diffuse and spotted knapweed in riparian recreation sites is a growing threat to the species. The metapopulation was considered stable (although some individual populations are declining in response to closed canopy conditions likely a result of fire suppression) until populations identified as critical for species persistence in the completed species management guide were disposed of in a land exchange.

*Perideridia erythrorhiza* (Piper) Chuang & Const. is a disjunct endemic from the *Quercus garryana* grasslands of the west Cascades and is extremely rare in the east Cascades where it is known from two sites in Klamath Co., Oregon. Recent unpublished molecular data (Baldwin, communication by letter) reveals separate lineages and suggests that the eastside and westside populations are genetically distinct. Within the East Cascades South physiographic province, the species is found at elevations of approximately 4200 feet in moist meadows dominated by *Deschampsia cespitosa*, *Poa pratensis*, *Koeleria cristata*, and *Festuca idahoensis*, and surrounded by mixed coniferous forests. Soils are silt-clays and loams and are generally moister than those occupied by more common species of *Perideridia*. The tuberous roots are used as a food source by native Americans. In western Oregon this species is threatened by urban expansion. Within the East Cascades province, sites fall under Federal ownership but are threatened by trampling and soil compaction resulting from livestock grazing. Direct herbivory is minor. The diking and draining of meadows around Klamath Lake may have permanently reduced the available habitat for this species. Collectively, population trends are declining; the trend for the East Cascades populations is unknown.

*Petrophytum cinerascens* (Piper) Rydb. is a local endemic along the Columbia River in Chelan and Douglas Counties, Washington, where there are three locations; all of which are on private land. It inhabits gneiss, rhyolite, and andesite rock cliffs and outcrops on slopes to 90% where other vegetation is sparse from 700 to 1600 ft. in elevation. This perennial forms mats from one square foot to six by three feet in size. Populations range from 100 mats to 1,000. It does not

occur north of the southern terminus of continental glaciation and may be a good indicator of global warming. Road-widening would destroy habitat.

*Phacelia inconspicua* Greene is a scattered endemic known from southwestern Idaho and northern Nevada. This rare annual occurs on sandy loams with surface sand and gravels. It prefers but is not restricted to, nival zones. In Idaho, sites range in elevation from 5,000 to 6,000 feet. Populations of *P. inconspicua* are typically small, isolated, and seasonally ephemeral. Significant threats to populations, stem from livestock grazing, mining, and introduced plant species (both from competitive exclusion and alterations of the historic fire regime). This species appears to be stable at the present time.

*Phacelia lenta* Piper is a local endemic to Douglas County, Washington. All nine of the occurrences in the Columbia River Basin Province are on private land. Populations often consist of several hundred plants. This perennial inhabits cracks and ledges in exposed basalt cliffs and talus from 1300 to 3400 ft. in elevation. This plant may fracture basalt. The showy flowers probably provide pollen and nectar for insects.

*Phacelia lutea* (Hook. & Arn.) J.T. Howell var. *calva* is a local endemic known from 13 occurrences in Owyhee Co., Idaho. The species occurs on weathered Sucker Creek Formation ash, and grey-white to dark brown montmorillonite and bentonite clays characterized by very low percolation rates. Sites range from approximately 4000 to 4800 feet in elevation and are generally found on barren, gentle, south or southwest facing slopes. Early spring moisture is crucial to successful establishment, and abundance of individuals in a given year is highly correlated with precipitation levels. Associates may include *Sitanion hystrix*, *Cleomella macbrideana*, *Chaenactis douglasii*, *Lomatium* sp., *Phacelia lutea* var. *lutea*, and *Mentzelia mollis*. As with other ash endemics, potential threats include trampling by livestock, off-road vehicle (ORV) traffic, and mining activity. Population trends are unknown.

*Phacelia lutea* (Hook. & Arn.) J.T. Howell var. *mackenziorum* Grimes & Packard is a regional endemic known from Malheur Co., Oregon. There are three sites in Malheur County. The species occurs on green-yellow Leslie Gulch tuff-talus characterized by high percolation rates. Early spring moisture is crucial to successful establishment, and abundance of individuals in a given year is highly correlated with precipitation levels. Potential threats include trampling by livestock, off-road vehicle (ORV) traffic, and possible mining activity. Population trends are unknown.

*Phacelia minutissima* Henderson is a scattered endemic ephemeral annual known from the upper Intermountain region. Historic collections of this species list a range of habitats though most are taken from seeps in sage or aspen on vernal wet side slopes of ephemeral (zero-order) drainages or mountain meadow complexes, where the plant is dependant upon spring and summer moisture for flowering. Recent collections in southern Idaho have been made in *Veratrum* stands down-slope from aspen, especially at sites with open understories. Soil conditions are usually well drained yet silty. Typical site elevations range between 5,000 and 8,200 feet. Threats to local populations and suitable habitat for *P. minutissima* include livestock grazing (mostly through soil disturbance), mining (especially in northern Utah), the invasion of

exotic plant species, and range improvements (especially water developments). Changes in fire frequencies may also represent a threat to some populations. The conservation status of this species was assessed recently (Moseley 1995a). The Boise National Forest and the Boise District BLM are conducting extensive surveys for this species in 1995 and 1996. This species was rediscovered in the Wallowa Mountains, Oregon in 1996.

*Phlox idahonis* Wherry is a local endemic found near Headquarters, Idaho. Currently, 98% of known *P. idahonis* sites are owned by Potlatch Corp. The historic range of this species is unknown. This species is found in low gradient streamside and grass/forb meadows in cold air sinks between 2,800 and 3,300 ft. It prefers an open canopy and is adapted to periodic fire. Much of the habitat for this species has been altered by grazing, land conversion, and fire suppression (by the consequent invasion of trees into its meadow habitat). Current threats include the lack of fire and hydrological alterations to its meadow habitat. There are permanent monitoring plots in place for this species (Moseley and Crawford 1993).

*Physaria didymocarpa* (Hook) Gray var. *lyrata* C.L. Hitchcock is a local endemic restricted to talus slopes in the Challis volcanics in central Idaho. Conservation agreements between the USFWS and BLM had been in place from 1984 until 1995 when the BLM declined to renew the 1990 agreement. The major threat to the viability of *P. didymocarpa lyrata* populations is mining. All populations of *P. didymocarpa lyrata* are in decline and all are currently experiencing some level of human disturbance.

*Physaria integrifolia* (Rollins) Lichvar var. *monticola* Lichvar is a regional endemic found in the Salt River and Wyoming Ranges of western Wyoming at fewer than thirty sites (ten within the Columbia River Basin) and in the Caribou Range in Bonneville County, Idaho. Its preferred habitat is sagebrush slopes, seeps, sloughing clays, rocky or talus slopes or ridges, or summit residuum. This taxa may be no more than a form of the species and is currently being reconsidered by Rollins (who did not include it in his recent Cruciferae of North America) and is no longer being tracked by Wyoming Heritage due to its uncertain taxonomic status (Fertig pers comm). The trend for this taxa appears to be stable.

*Pleuropogon oregonus* Chase is a regional endemic known from Lake County, in southeastern Oregon, and Union County, in northeastern Oregon. All known sites are on private land. None of the known sites occur on public land. *Pleuropogon oregonus* habitat is characterized by level, moist meadows with slow moving water at elevations between 3,600 and 5,600 feet. Common associated species include *Deschampsia cespitosa*, *Hordeum brachyantherum*, *Poa cusickii*, *Eleocharis palustris* and *Carex nebrascensis*. The species may have been more widespread in the past, but grazing and related activities have reduced habitat and population numbers. Livestock presence in these habitats is identified as an extreme threat, and spring grazing has proven detrimental. The specific impacts of grazing that effect this species are trampling and churning of the wet soils, and by the lowering of the water table associated with downcutting and channelization. Following site modification by cattle, subsequent increases in exotic plant species (including pasture grasses) also threaten this species. A portion of the Lake County populations are protected under a Nature Conservancy easement agreement with private landowners. Population trends are unknown, though probably declining.

*Polemonium pectinatum* Greene has a regional distribution, endemic to east-central Washington. In the Columbia River Basin Province, 32 of the 40 occurrences in Lincoln, Whitman and Adams Counties are on private land. Populations usually include several hundred individuals. It grows in alluvial and colluvial soils, often with a mix of loess and glacially derived material. It ranges from 1480 to 2300 ft. in elevation. This perennial tends to do best in those sites that are in good ecological condition. Sites invaded with *Bromus tectorum* or *Poa pratensis* have very small populations. There is generally no or only a limited tree component in the shrub and bunchgrass communities where this perennial is found. Historically known from the Palouse, but due to land conversion to agriculture with its accompanying hydrological changes, it has been extirpated. Loss of habitat is still a high threat. Heavy grazing, invasion of exotic species, and drawing down water tables from water developments are significant threats. Isolation and fragmentation of populations may have resulted in a loss of viability.

*Potentilla cottamii* N. Holmgren is a regional endemic found in Utah at two sites in the southern Raft River Range. It is confined to schist and quartzite substrates and occupies cracks, crevices, and recesses in high elevation (9,440-9,740 feet) rocky outcrops on north and shaded south aspect slopes. Mining is the greatest existing threat to this species though roads and livestock grazing can be a problem.

*Primula alcalina* A. Cholewa & D. Henderson is a local endemic known from low gradient streamside meadows in the Beaverhead Mountains at elevations between 6,294 and 6,720 ft. The streams in which this species is found are continually fed by springs thereby maintaining stable flow levels throughout the year. Soils are alkaline, fine textured, and have a high organic fraction. Seed dispersal is highly localized. The conservation biology of this species has been studied in some depth (Kelso 1991, Muir and Moseley 1994, and Moseley 1995b). Land ownership of *P. alcalina* sites is mixed (25% State and Federal, and 75% private). Direct threats to population viability have been documented to stem from livestock grazing and the invasion of exotic plant species. Moderate threats from recreational use of *P. alcalina* habitat have also been noted. This species is in decline throughout its range.

*Ranunculus reconditis* Nels. & Macbr. is a local endemic found on open grassy hillslopes underlain by rocky basaltic substrates in Lincoln and Klickitat Counties (where there are nine occurrences), Washington and Wasco County, Oregon, where there are three occurrences. Populations usually consist of several hundred plants. It grows primarily in *Festuca idahoensis*, *Purshia tridentata*, and *Hieracium cynoglossoides* grasslands, but also in open oak stands from 1900 to 4000 ft. in elevation. This species occurs on the upper one-third of slopes and ridges, on all aspects. This perennial withstands low to moderate grazing, but is very susceptible to prolonged or high intensity grazing. Its potential habitat has decreased from land conversion. This early flowering species probably provides an early food source for pollinators and herbivores. Threats are from loss of habitat and conversion of potential habitat though population trends are considered stable at this time.

*Rorippa columbiae* Suksdorf ex Howell is a scattered endemic; distributed from the Columbia River south to the Great Basin and East Cascades with disjunctions in California and New

Mexico. It is known from one site in Klickitat County, Wa., in the Columbia River Gorge on private land. Species occurrences are limited to the margins of intermittent and perennial streambanks, channel bottoms, cobble bars with fine silty matrices, and lake margins that are at least seasonally flooded or sand and rocky cobble. Site elevations range from 4100 to 5320 feet. Vegetative cover is generally less than 15 percent, with overstory openings maintained by channel scouring or seasonal flooding. Common associates include *Camissonia tanacetifolia*, *Coreopsis akinsonia*, *Phalaris arundinacea* Downingia spp., *Potentilla* spp., *Rumex* spp., *Artemisia cana*, and *Juncus* spp. The species is facultatively autogamous and while there are many stems only a low percentage of these reproduce sexually. Fruits ripen in mid- to late summer and are dispersed by gravity, wind, and most effectively by moving water. The species is negatively impacted by heavy grazing and trampling, these having caused the extirpation of some sites. This species is further threatened by variable water levels from dams and the invasion of exotic plant species. The condition of many populations appears to be declining. The majority of sites occur on public land, and a range-wide Conservation Strategy is currently being developed by the USFS, BLM and Oregon Department of Agriculture.

*Rubus bartonianus* Peck is a local endemic found in Hell's Canyon on rocky scree slopes, lower slopes, canyon bottoms, and occasionally into the river bottom at elevations between 1,000 and 4,500 feet. Its habitat is generally described as a heterogenous shrubland. Though geographically restricted, it is locally common. There are very few threats to the viability of most populations of *R. bartonianus*. In limited areas, livestock grazing and recreation trail maintenance have been a problem. Exclusion of fire may have allowed fuel loads to accumulate, leading to more intense, potentially threatening fires, but the fire ecology of *Rubus bartonianus* is not well understood. Much habitat, and likely a large number of individuals were destroyed by the construction of Hell's Canyon Dam and the reservoir it created. In 1995, the Idaho Native Plant Society recommended that this species be reduced in Federal status from C2 to 3C.

*Rubus nigerrimus* (Greene) Rydb. is a locally distributed endemic species in the Snake River Canyon and adjacent tributaries in southeastern Washington. In the Columbia River Basin Province, the 19 occurrences are all on private land in Whitman and Garfield Counties. Populations are small. It is found in draws and canyon bottoms, although very rarely on mid- and upper slopes. Elevations range from 700 to 2400 ft. along the Snake River and up to the breaks. This perennial provides soil stabilization, berries for birds, and cover for birds and small mammals. Flooding from dams on the Snake River have probably inundated historic sites and many sites are severely impacted from grazing. Exotic species such as *Rubus discolor* and *R. laciniatus* threaten populations. A change in fire regime is a significant threat.

*Saxifraga bryophora* A.Gray var. *tobiasiae* Grimes & Packard is a highly localized endemic known from a single area on Bruin Mountain north of McCall, Idaho on the Payette NF. It occurs on open rocky slopes of small terraces and on gravelly ridge tops between 7,500 and 7,650 feet. There is no information on the threats to or viability of the known populations, however the extensive fires on the Payette National Forest in 1994 caused the extirpation of one of the five known sites for this taxa.

*Senecio ertterae* Barkley is a local ash endemic, known from eleven occurrences in Leslie

Gulch, in the Owyhee Uplands of Malheur Co., Oregon. It is a late-flowering annual, and moisture provided by summer and early fall thundershowers appears to be critical to population fitness. The species is found on lower slopes and in desert washes on greenish-gray gravelly tuffaceous ash. Vegetative cover rarely exceeds five percent, and associated species are limited to annuals. *Senecio etterae* is favored by hydrologic disturbance, and increased significantly in abundance following a summer flash flood in 1986. Livestock grazing and trampling is a potential threat, and cattle trails exist at several sites. Invasion of sites by exotics, including peppergrass and cheatgrass, and potential invasion by whitetop, yellow star thistle, and Scotch thistle may also pose a threat. Zeolite mining is not an immediate threat, but could become one if mining were initiated within *Senecio* habitat. Recreational development and foot traffic may also be potential threats. Populations are considered stable at this time.

*Sidalcea oregana* (Nutt.) Gray var. *calva* C. L. Hitchc. is a local endemic, found in the Wenatchee Mountains in Chelan and Kittitas Counties in Washington, where three of the five sites in the East Cascades North Province are on public land. Four more are historical and probably extirpated and three other sites have not been able to be relocated. It occurs in moist seeps, springs, riparian areas, and meadows with surface water or saturated upper soil profiles in the spring, but dry by the end of the summer. This perennial grows in areas with 100% vegetative cover. It occurs from 1380 to 5060 ft. in elevation. Since this plant occurs in habitat in early successional stages, fire may play a role in the development and maintenance of populations. The addition of cattle excrement may be a threat. Physical disturbance during timber harvest, changes in fire regime as it affects hydrology, and erosion associated with grazing are significant threats.

*Silene seelyi* Morton & Thompson is a local endemic to the Wenatchee Mountains of southern Chelan and adjacent Kittitas Counties in Washington. There are 20 occurrences in Chelan and Kittitas Counties, most of which are on National Forest Service land. A perennial known from shaded crevices in ultramafic to basaltic cliffs and rock outcrops, it occasionally occurs among boulders in talus. Plants grow from 1500 to 7000 ft. in elevation. Habitat types include *Pinus ponderosa*, *Pseudotsuga menziesii* and *Picea engelmannii* with canopy cover less than 30% and slopes 15 to 20%. Population sizes are small, ranging from two to 50 individuals. Threats from road construction and rock climbing are significant.

*Silene spaldingii* Watson is a regional endemic and part of the Palouse Prairie flora. Globally, this species is known from southeastern British Columbia, southeastern Washington, northeastern Oregon, northwestern Montana, and northern Idaho. It occurs at elevations between 2,800 and 5,100 feet. Most of the populations are on private land. It prefers deep (loess) soils and is usually found on ridgetops and slopes (5-60%) with any aspect. It grows in *Festuca idahoensis* and *Pinus ponderosa* plant communities. Most populations of *S. spaldingii* are on private lands. *Silene spaldingii* is typically pollinated by bumblebees but, due to the frequently small population sizes, the maintenance of a viable and effective pollinator fauna is problematic. Experimental exclusion of pollinators resulted in high levels of inbreeding depression, as measured by several reproductive parameters. This suggests that the presence of pollinators is critical to population viability (Lesica 1993b). Significant historic threats to this species include agricultural land conversions and the disruption of the native fire regime. Today, threats to the

viability of this species stem from continued habitat conversion, livestock grazing, the lack of fire, the invasion of exotic plant species, and herbicide spray and drift. Since most populations of *S. spaldingii* are reproductively isolated, the viability of the species is at risk from genetic and demographic stochasticity. This species has recently been recommended for placement in Category 1, and a listing petition has been submitted to the U.S. Fish and Wildlife Service by the Montana Native Plant Society and other interested parties.

*Sisyrinchium sarmentosum* Suksd. ex Greene is a peripheral species in Washington. There are two occurrences in Klickitat County, both on private land. Population sizes range from 100 to 200 plants. This perennial inhabits subalpine and montane meadows in the *Abies grandis* and *A. amabilis* zones. It is found in wet seeps and areas wet in spring and midsummer. Soils are deep to medium deep and are derived from volcanics, primarily basalt, aeolian, glacial till, colluvium, alluvium and residuum. Sites range from 1200 to 6000 ft. in elevation with slopes of less than 15%. The species is sensitive to changes in water regime. It is palatable and sensitive to grazing and trampling, as well as the exotic plants introduced by cattle and people. Fire could have a positive influence in creating openings of potential habitat, as well as a negative influence by changing the hydrology of basins. Developments also threaten its habitat.

*Stanleya confertifolia* (Robins.) Howell is a regional endemic known from the Baker Co., Oregon, to southeastern Oregon Harney, Malheur and east to Idaho in Owyhee and Washington Counties. The species is an annual (occasional biennial) found on open, barren ashy and sandy sites, on plains and low hills. Flowers bloom from May to June, and early spring precipitation appears crucial to successful establishment and seed set. Little is known regarding potential threats to, and population trends of, this species.

*Stephanomeria malheurensis* Gottlieb is a federally listed, endangered local neoendemic. An autogamous annual species, it is found at one site in the Basin and Range Province, in Harney Co., Oregon, where it grows on an ancient lake bed of very gentle slope that was uplifted during pre-Pleistocene times. Substrates are gravelly sandy loams. Almost all known extant *S. malheurensis* is derived from an outplanting of progeny raised at the Berry Botanic Garden, Portland, Oregon, from material stored at the University of California, Davis. Population size varies annually with precipitation. Associated species at the site include *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus* spp., and *Elymus cinereus*. *Stephanomeria malheurensis* is closely related to *S. exigua*, which is sympatric, and has been derived from the latter species by a change to a self-pollinating breeding system. Historically, this species was on a decreasing trend, and the current trend remains unchanged. The site has been fenced to exclude grazing, but low seed set, seed predation and cheatgrass invasion pose considerable threats to the species' viability. The population resides on an old zeolite mining claim, and renewed interest in mining may introduce a future threat.

*Sullivantia hypomania* (Counter & Fischer) Counter var. *hypomania* in Idaho is disjunct from the primary range of this taxa. It is found in the lower canyons of the Middle Fork Salmon River and its tributaries. It is restricted to shaded cliff faces in the spray and splash zones around waterfalls. Idaho populations of *S. hypomania hypomania* are all located in wilderness and have no discernible threats.

*Tauschia hoverii* Math. & Const. is a local endemic, found in Yakima and Kittitas Counties, Washington. In the Columbia River Basin Province, 20 of the 39 occurrences are on federal land. Populations of this small perennial often number into the thousands. It grows on basalt scablands in the *Artemisia rigida* and *Poa secunda* habitat type on lithosol soils on zero to five percent slopes. It ranges in elevation from 1700 to 3270 ft. It is an important root for the Yakima Wanapum Indians. Threats from grazing and roads are high.

*Texosporium sancti-jacobi* (Tuck.) Nadv. is a regionally endemic lichen found in southern Idaho and eastern Oregon that requires good, or excellent range conditions. It is usually found on old humus or decadent *Poa secunda* clumps. Elevations of known *Texosporium* sites range between 2,400 and 3,300 ft. This species is in decline due to threats from degrading range conditions (attributed to livestock grazing, changes in fire frequency, land conversion, and introduced vascular plants). Four sites burned in range fires in 1996. A single disjunct collection of this species was made in Pinnacles National Monument, California (McCune 1992).

*Thelypodium eucosmum* Robins is a restricted regional endemic distributed mainly within the upper John Day River watershed in Grant and Wheeler Counties, Oregon. It is found between 1,200 and 3,900 feet in elevation, on deep volcanic silt (John Day volcanics), light colored montmorillonite clays, and pyroclastic metasedimentary soils. It is associated with ephemeral streambeds, and open juniper - sagebrush - bunchgrass communities typically on ashy-clay soils in *Juniperus occidentalis* woodlands. Though most often observed to be biennial it can persist for two or three years under some conditions. It is highly palatable and desirable to wild and domestic ungulates. Livestock grazing practices and habitat conversion to agricultural lands have dramatically reduced its distribution and available habitat. Changes in the historic fire regime leading to fewer fires of greater intensity damage *Thelypodium eucosmum* rosettes and its seed bed, especially directly under juniper.

*Thelypodium howellii* Wats. ssp. *howellii* is a scattered endemic known from a small hand-full of historic collections in Crook, Deschutes, Grant, Harney, Lake and Klamath Counties, Oregon, and from five populations near Susanville in northeastern California. It is currently considered extinct in Oregon. It is a biennial species that occurs on moist, alkaline soils in river valleys, at the margins of ponds and lakes, and within alkaline meadows and plains. Historic site elevations ranged from 4500 to 4700 feet. Grazing by livestock is the greatest threat to the species.

*Thelypodium howellii* Wats. ssp. *spectabilis* (Peck) Al-Shehbaz is a local endemic known from Union, Baker (Baker Valley), and Malheur Counties, Oregon. Several occurrences have been extirpated in the recent past (Youtie 1995). This species is associated with alkaline bottomlands, basins, flats, and floodplains. It is commonly associated with *Sarcobatus vermiculatus*, *Elymus cinereus*, and *Deschampsia cespitosa* at sites between 3,200 and 3,400 feet in elevation. This species is highly palatable and desirable to wild and domestic ungulates. Spring and summer grazing is harmful but fall grazing may provide satisfactory results by impacting competing vegetation. All known populations are on private land. This plant is one of the most imperiled plants in Oregon.

*Thelypodium repandum* Rollins is a local endemic restricted to the Challis volcanics and associated metamorphics. This annual mustard is found exclusively on steep talus slopes. Populations appear to be stable at this time. Identified significant threats to this species include road construction and mining. Limited threats stem from livestock grazing and exotic species. Long term monitoring of *T. repandum* is ongoing.

*Tofieldia glutinosa* (Michx.) Pers. ssp. *absona* Davis is a boreal disjunct species known from a single site on Priest Lake in northern Idaho. It is restricted to sphagnum peat substrates. Threats to this species at Priest Lake include land development and alterations to the local hydrologic regime. This species is both difficult to locate and identify. There may be more suitable habitat in northern Idaho.

*Trifolium douglasii* House is a regional endemic only known from three sites in Whitman County, Washington and six sites in Umatilla and Union Counties, Oregon. It inhabits moist, temporarily flooded meadows and forested wetlands, and streambanks. Historically, this species was found from Spokane County, Washington to Baker County Oregon and east to adjacent Idaho. *Trifolium douglasii* has been severely impacted by habitat conversion to agricultural uses and by seeding of exotic grass species, although it may tolerate some rotational grazing regimes. The effects of fire on this clover are not known but spring burns are likely detrimental to its early spring seed production.

*Trifolium owyheense* Gilkey is a regional endemic species restricted to the ash deposits of southwestern Idaho and adjacent Oregon. The annual prevalence and reproductive capacity of this species depends on soil moisture availability. It prefers sparse sites (less than 30% cover) with modest slopes (0-30%). Known populations occur between 2,600 and 4,500 ft. The trend of this species is unknown. Changes in the historic fire regime, mining, the invasion of exotic species, and OHVs are all seen as significant and important threats to *T. owyheense*. Lesser but still important threats stem from livestock grazing and road construction.

*Trifolium thompsonii* Morton is a local endemic in Washington in eastern Chelan and Douglas Counties, where there is one occurrence on private land in Douglas County. In the rest of the East Cascades province there are 20 occurrences with the majority of sites on federal land. Although its range is restricted, its habitat is highly variable. This perennial grows on basalt scablands, as well as areas with deeper soils of loess and sandy loam. Found at elevations from 1000 to 3700 feet in plant communities of *Artemisia tridentata*, *Purshia tridentata*, *Festuca idahoensis* and *Agropyron spicatum*-*F. idahoensis* with less than 20% cover. It seems to be more abundant on sites with northerly aspects. Population sizes range from 40 up to one with 2,000 plants scattered over several acres. The population in Douglas County in the Columbia River Basin province is atypical, as the others in eastern Washington are on moderately steep slopes in a mosaic of forest and grassland. It provides pollen and nectar for bees, and fixes nitrogen. Exotic weed invasion and development are threats.

*Eriogonum codium* Reveal, Caplow & K. Beck, *sp. nov.* is a local endemic recently described as a new species found in 1994 on the Hanford Nuclear Reservation, Benton Co., Washington. Found on the northern edge of Umtanum Ridge, about 38 air miles northwest of Richland, Washington, on volcanic soils associated with *Grayia spinosa*, *Artemisia tridentata*, *Salvia dorii*, *Hesperostipa comata*, and *Psuedorogeneria spicata*. The basalt desert buckwheat is highly restricted in distribution. The only known population occurs at elevations ranging between 340 and 400 m on flat to gently sloping substrates at the top edge of the steep, north-facing basalt cliffs of Umtanum Ridge overlooking the Columbia River. Approximately 5000 plants grow interruptedly in a narrow band 2.5 km long and generally less than 30 m wide. The new species occurs exclusively on the exposed basaltic flow top of the Lolo Flow of the priest Rapids Member of the Wanapum Formation, with the gaps in the population correlating with the absence of exposed flow top. Umtanum Ridge is currently managed by the U.S. Department of Energy. the Hanford Site has large areas of relatively undisturbed, high-quality shrub-steppe vegetation due to the cessation of virtually all agricultural and grazing activities when the site was established in 1943. Therefore, this plant does not appear to be threatened by human activities at this time. Change in ownership or changes in the Dept. of Energy's management policies which would permit grazing or agriculture or even recreational petrified wood collectors could potentially effect the viability of this highly restricted species

*Lesquerella tuplashensis* Rollins, Beck & Caplow, *sp. nov.* is another newly discovered local endemic recently discovered on the Hanford Nuclear Reservation, adjacent to the Hanford Reach of the Columbia River. Named after the White Bluffs of the Columbia River where the species occurs, "tuplash" is a place name for the White Bluffs in the Sahaptin language. Closely related to *L. douglasii*, *L. tuplashensis*, grows on the upper edge and upper face of the White Bluffs adjacent to the Columbia River. The only known population is found on the upper zone and top of a near vertical exposure of cemented, highly alkaline calcium carbonate paleosol (a "caliche" soil). Highly restricted in its distribution, the White Bluffs population may be the only one of the species, though several similar areas were searched. The population is approximately two to seven m wide and extends for 17 km along the upper edge of the bluffs. Vegetation cover along the bluffs is sparse and includes several other plant species that are rare in Washington, including: *Cryptantha spiculifera*, *Astragalus geyeri*, *Cuscuta denticulata*, and *Camissonia pygmaea*. Management threats are similar to *Eriogonum codium*.



## Rare Species Habitat Group Analysis

The ICBEMP database manager used Natural Heritage Program records to produce a list of plant taxa considered rare at the state level. As for the species of rangewide conservation concern, this list was then sorted to produce sublists specific to individual panel analysis areas. The task of the expert panels was to sort these taxa into groups that share similar ecological requirements, as determined by broad habitat affinities. The Vascular Plant Task Group of the Science Integration Team provided six broad habitat types for the panelists to use in grouping the species: alpine, aquatic/riparian, forests, grasslands, rock, and shrublands.

The panelists first reviewed the analysis area list of state rare taxa and made additions and deletions as needed. They then grouped the taxa into one or more of the habitat categories, and assessed the degree of threat to those habitats.

Lastly, with reference to the 45 CRB, SRM and SAF cover types (Tables 3 and 4) that were used in the ICBEMP assessment, panelists decided how finely they wanted to subdivide the broad habitat categories (e.g., into subgroups based on more specific cover types, such as rough fescue and Idaho fescue types within the broader grassland category, or into elevation zones, such as low- and high-elevation grasslands). Lists of rare plant species associated with each habitat group or subgroup were then compiled, and environmental correlate forms were completed for those groups/subgroups in an approach similar to that used for the individual taxon assessments. Upon completion of the habitat group forms, the lists were reviewed to make sure all rare taxa were addressed.

TABLE 3. CRB, SRM and SAF cover type vegetation codes.

VEG CODE	Description
CRB003	Shrub or Herb / Tree Regen
CRB005	Alpine Tundra
CRB006	Barren
CRB007	Herbaceous Wetlands
CRB008	Pacific Silver Fir / Mt. Hemlock
CRBS01	Juniper Woodlands
CRBS02	Mixed Conifer Woodlands

CRBS03	Juniper / Sagebrush
CRBS04	Big Sagebrush
CRBS05	Shrub Wetlands
CRBS06	Agropyron Bunchgrass
CRBS07	Native Forb
VEG CODE	Description
CRBS08	Exotic Forbs / Annual Grass
CRBS09	Grand Fir / White Fir
CRBS10	Whitebark Pine / Alpine Larch

CRBS11	Red Fir
CRBS12	Cropland / Hay / Pasture
CRBS13	Fescue-Bunchgrass
CRBS19	Urban
CRBS20	Water
SAF205	Mt. Hemlock
SAF206	Engelmann Spruce / Subalpine Fir
SAF208	Whitebark Pine
SAF210	Interior Douglas-fir
SAF212	Western Larch
SAF215	Western White Pine
SAF217	Aspen
SAF218	Lodgepole Pine
SAF219	Limber Pine

SAF227	Western Red Cedar / Western Hemlock
SAF233	Oregon White Oak
SAF235	Cottonwood / Willow
SAF237	Interior Ponderosa Pine
SAF243	Sierra Nevada Mixed Conifer
SAF245	Pacific Ponderosa Pine
SRM104	Antelope Bitterbrush / Bluebunch Wheat Grass
SRM402	Mt. Big Sagebrush
SRM406	Low Sage
SRM414	Salt Desert Shrub
SRM421	Chokecherry / Serviceberry / Rose

TABLE 4. Forest and nonforest structural stages and their abbreviations

Acronym	Definition
si	stand initiation
seoc	stem exclusion open canopy
secc	stem exclusion closed canopy
ur	understory re-initiation
yfms	young forest multi-story
ofms	old forest multi-story
ofss	old forest single stratum
w_si	woodland stand initiation

w_se	woodland stem exclusion
w_ur	woodland understory re-initiation
w_oms	woodland old multi-story
w_oss	woodland old single stratum
nf	nonforest ( not forest,shrubland or herbland)
oh	open herbland
ch	closed herbland
ols	open low and medium shrubs
cls	closed low and medium shrubs
ots	open tall shrubs
cts	closed tall shrubs

The results of this analysis is presented in appendix 3. In each section of the analysis, a list of species by major habitat group is provided with GIS attributes and themes. This information is given to facilitate planning efforts in for future ecosystem management projects. Each section is prefaced with a short description of the important general physical attributes of each habitat group and a short discussion of the impacts of current and historic land use practices. In each case, the generalities have been stressed. We recognize that there is and always will be variation with the Interior Columbia Basin with respect to the intensity and nature of threats.

### Rare Plant Communities

With increases in human influences on ecological processes, vegetation structure and function, there has been a significant loss of native plant communities and ecosystems across the United States (Nature Conservancy 1974). Concerns for the maintenance of diversity exists fall all its interactive levels, including genetics, species, communities, and ecosystems (Langner and Flather 1994). Concerns such as these prompted the need to identify and assess the status of rare plant communities within the Columbia River Basin.

An inventory and assessment of the status of rare plant communities was conducted by Maria Mantas for this analysis in 1995. Lists of plant communities (including potential vegetation types, community types and plant associations) were obtained for each state in the ICBEMP assessment area, in consultation with the Natural Heritage Programs and Conservation Data Centers. Priority for assessment was placed on 223 plant communities ranked by the Heritage

Program as globally rare (G1 and G2). A G1 community is defined as: Critically imperiled globally because of extreme rarity (5 or fewer occurrences) or because of some factor making it vulnerable to extinction; G2: Imperiled globally because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it vulnerable to extinction throughout its range. Communities ranked as G3 (either very rare and local throughout its range or found locally in a restricted range or because of other factors making it vulnerable to extinction throughout its range (20 to 100 occurrences)) were omitted from assessment. State-ranked communities that are not ranked as G1 or G2 were also omitted, due to the complexity of analyzing the potentially large number of communities had they been included. Where possible, rarity class, threats, trends, and distribution within the Columbia River Basin were identified. This information was gathered through the expert panel process and from Natural Heritage Program/Conservation Data Center ecologists.

Plant Communities that were inherently rare because of a unique set of abiotic features, and those that were once more common, but reduced due to management, as especially vulnerable to extirpation. For example, the bunchgrass grasslands of the Palouse region, once expansive in area, have been reduced to a few remnant stands due to agricultural conversion. Low elevation cedar/hemlock old-growth forests, on the other hand, may never have occupied a large portion of the landscape, yet have been disproportionately affected due to the extraction of large volumes of timber available in this highly productive areas. It is hoped that the information given here will assist managers by placing the concerns for sustainability of these communities in context with their status on a regional scale. In addition, potential for restoration of some communities may be prioritized and perhaps expedited by knowledge as to which communities are globally at risk, and what the known threats are for these unique areas.

Plant communities are assemblages of organisms that are repeatable over the landscape (Bourgeron and Engelking 1994). Many classification systems have been applied to characterize a grouping of plant species as a definable unit. Although there is still a need for continued classification and standardization, the Natural Heritage Program Network has gone far in compiling and standardizing a classification of plant communities in the Western United States. This work (Bourgeron and Engelking 1994) was used as the basis for identifying rare plant communities that occur in the Columbia River Basin. The results of the rare plant community analysis is presented in appendix 4.

### **Plant Taxa of Cultural Importance**

There was a separate working group within the Interior Columbia Basin Ecosystem Management Project's Science Team dedicated to coordinating with Native American Tribes. In support of their effort, and to help assure the continued harvestability of culturally significant plants, an analysis of species by vegetation type and seral stage is provided in appendix 5. This list of species is not to be considered a complete listing of plants used by the Indian people of the

project area. It is apparent that there was once a much wider recognition and utilization of the native flora than there is currently. Tribal Elders will stress that all plants once had a recognized use.

The list in appendix 5 was compiled in consultation with the Tribes, and further refined by Richard Helliwell. Helliwell is currently the Forest Botanist on the Umpqua National Forest and was formally employed by the Confederated Tribes of Warm Springs. He is a recognized and respected authority on culturally significant plants.

## **Research, Development and Applications**

The lack of knowledge concerning certain areas of species biology and ecology interfere with the land manager's ability to effectively manage and conserve rare vascular plant taxa. Broad, one size fits all, directions for rare plant management have proven to be problematic. Vague guidelines are often difficult to interpret or implement. To rectify this situation, the vascular plant task group identified research, application, and application needs that would specifically improve our ability to manage or protect species of conservation concern. This included identification of inventory, monitoring, taxonomic, and ecological studies needed in addition to studies needed to determine the impacts of management activities for the species of rangewide viability concern. The Research, Development, and Applications (RDA) database was compiled with input from expert panels conducted throughout the ICBEMP assessment area and contract reports concerning taxonomically diverse genera.

The database itself is available in a Paradox 4.0 runtime application that can be queried by species, level of endemism, key words (a list of functional key words is provided with the software), or geographic area. The RDA is summarized in tabular form in appendix 6. Copies of the database are available through the database manager for the Interior Columbia Basin Ecosystem Management Project in Walla Walla, Washington.

## **Flora of the Columbia River Basin**

CRBFLORA is a checklist of vascular plant species found in the Interior Columbia Basin assessment area. The data was compiled by Peter Rice at the University of Montana, the Soil Conservation Service "PLANTS" database, and several other existing sources. Much of the compilation of the CRBFLORA was completed by Karl Urban from 1994-1995. Nomenclature follows Hitchcock and Cronquist (1973). The CRBFLORA checklist is presented in appendix 7.

The CRBFLORA checklist has tremendous potential for use in additional analyses. The Floristic Biodiversity of the Camas Ecosystem Analysis Area (Urban 1995) is an excellent example. Using a matrix database of 1,234 vascular plant species for seven plant association groups, Urban as able to provide the following results:

- the number of vascular plant species presently occurring in the analysis area,
- a comparison of the floristic richness of the analysis area with other areas on the Umatilla National Forest,
- delimit ecological distributions and habitat affinities or the species within plant association groups,
- a historic listing or former or present sensitive plant species,
- a determination of other plant species that are "at risk" in the analysis area,
- a ration of introduced to native species,
- a list of noxious weeds in the analysis area,
- and a list of culturally significant plants to assure their continued harvestability.

This level of analysis is appropriate for many scales and may prove to be an invaluable tool in future ecosystem based planning efforts.

Electronic copies of the checklist are available from the database manager for the Interior Columbia Basin Ecosystem Management Project in Walla Walla, Washington.

## Conservation

Appendix 2 contains a list of the species conservation reports that are completed for species of conservation concern within the ICBEMP assessment area. This information was compiled by Leah King in 1995. Again, it is important to note that this information is not current, though it does represent the first comprehensive summary for the assessment area. The following terms are used extensively in that appendix and further defined here.

**Conservation strategies:** Conservation strategies (also known as species management guides or plans) are typically developed for candidate and sensitive species, as a means of preventing the need to federally list them as threatened or endangered. The strategies are species-specific documents that outline the biological and ecological limiting factors that most influence the species' viability and distribution. They are compiled from the best scientific information available for the species. They provide recommended conservation measures, usually with reference to specific populations, on how to best manage or protect the species. Conservation strategies also usually include action and monitoring plans. Conservation strategies are typically internal documents prepared by a federal agency, and are usually implemented by line officer approval and/or amendment of a planning document (e.g., a Forest Plan).

**Conservation agreements** are formal written documents agreed to by the U.S. Fish and Wildlife Service and another federal agency; they may also involve tribes, state agencies, local governments, and/or the private sector. The objective of a conservation agreement is to reduce the threats to a candidate species and/or its habitat through voluntary cooperation, by documenting the specific actions and responsibilities for which each party agrees to be accountable. If effective, these agreements may lower the listing priority or eliminate the need to list a species.

Listing packages are compiled by the U.S. Fish and Wildlife Service, and present the information that supports a proposal to federally list a species.

Recovery plans are prepared after a species is federally listed, and present the objectives for recovering a species to the point where it can be delisted.

Status reports (also occasionally referred to as biological investigations) summarize the current biological, ecological and geographic data available for a species. These reports typically precede the development of conservation strategies or agreements, and usually are prepared as a result of focused field surveys aimed at assessing the species' status.

### *Ex situ* conservation

The following discussion on the role of ex-situ conservation in the management of rare plants in the ICBEMP comes from a report prepared under contract by Linda McMahon and Ed Guerrant (1995) of the Berry Botanic Garden, Portland, Oregon, for this project.

*Ex situ* or "off-site" conservation describes a range of activities more or less separated from "on-site" or *in situ* activities. Many interactions and overlaps exist between off-site and on-site activities; however, *ex situ* activities are usually considered to be such activities as seed storage, maintaining living collections at botanical gardens, or various research activities. *Ex situ* is not an alternative to *in situ*, but both are part of a larger, comprehensive conservation effort.

The Botanic Gardens Conservation Strategy (World Conservation Union, 1989), jointly produced by the World Conservation Union (IUCN), Botanic Garden Conservation International (BGCI: formerly Botanic Garden Conservation Secretariat, or BGCS), and the Worldwide Fund for Nature (WWF), states: "*In situ* and *ex situ* are the opposite ends of a spectrum and there is no absolute distinction between them." That document goes on to call for a "seamless blend" of *in situ* and *ex situ* conservation as the most effective way to conserve species and ecosystems.

Several methods of off-site conservation exist that can be considered for use as part of a conservation and recovery program for rare plants within the ICBEMP assessment area.

*Ex situ* or off-site conservation is generally considered to consist of germplasm storage methods such as seed banks, maintaining living collections, and tissue storage (such as in tissue culture, or pollen). Also relevant are many activities that take place, at least in part, away from wild sites and habitats, but that rely heavily on material from these sites, including efforts at replanting, restoration, and transplantation, studies of soil seed banks, and laboratory research (e.g. taxonomic, life history). Off-site storage of seeds is not an end in itself, but one means among many that contribute to the end of conservation. "New populations can arise phoenix-like out of the ashes of extinction only if collections exist off-site. It is also critical to note that *ex situ* collections are not an end in themselves. Their ultimate value will be derived from how they are

used and their effect, if any, on the long-term prospects for survival of rare plant species" (Guerrant, 1992).

#### Relevance of Ex Situ Conservation: Why Have Off-site Collections at All?

Off-site conservation must be considered in context with other conservation activities, including outplantings to enhance existing wild populations, reintroduction to a historical site, introduction of species within an existing range to enhance species survival, and experiments with introduction or reintroduction. Reintroductions and other similar activities are far from an exact science.

In some ways, are all experimental, since the experience of the conservation community with these strategies is relatively recent, and long-term monitoring studies are just beginning. Few examples of these activities have been ongoing for over 20 years.

Mitigation activities often specify certain types of *ex situ* conservation, such as seed storage or transplantations of individual plants to new sites. Experience with these shows that transplantations of existing plants in the wild to new sites are rarely successful, even in the short run (Fahselt, 1988; Fiedler, 1991; Hall, 1987). Indeed, translocation is a controversial technique, possibly with limited conservation value. The above mentioned references note that most failed because of lack of site preparation and post-establishment care. Many sites of transplantation require continued watering, mulching, shade protection, grazing protections, insecticides, pest and weed control. The more successful projects tended to be those with more planning and care invested in the project. Gordon (1994) presents a 'decision tree', in the form of a dichotomous key, that aims to inform land managers when and where translocation might be considered appropriate.

Revegetation or restoration seems to be somewhat more successful, particularly when plants are propagated specifically for this purpose. Evans and Bohn (1987) report success in cultivating many California species, particularly woody plants, for restoration projects.

#### Genetic Consideration

Many biologists refer to genetic considerations in the published literature when undertaking any conservation activity and stress the following of guidelines to protect and enhance genetic integrity. In the context of mitigation, this loud and repetitive voice is certainly appropriate. In the context of species recovery, *ex situ* conservation, restoration, and management, it is equally important. Ferreira and Hillyard (1978) discuss the following needs: to define "local" population, to be very careful with the genetics of plant species, to know genotype and location of all material used in any vegetation enhancement, and to tighten up contracts to account for genetic credibility.

For seed banks, protocols are becoming firmly established. Brown and Briggs (1991) advocate collecting a high amount of genetic material for seed banks—material kept separate for each maternal parent plant, collected at different times and from different plants, and from varying

numbers of populations. The Center for Plant Conservation (CPC, 1991) has compiled guidelines for this purpose.

Fenster and Dudash (1994) advocate the need to incorporate genetic considerations in any restoration project. They cite factors such as inbreeding and outbreeding depression and genetic diversity of stock material. In the same book on restoration, Pavlik (1994) cites the need to monitor projects adequately. He considers monitoring "crucial" to the success, and points out that monitoring is a highly developed science involving statistical trends analysis--census data alone are not enough.

The question of limited resources is always with us. Certainly, we must make priorities whenever possible and make sure that any overall conservation plan for a species or habitat is appropriate for that site or species. In some ways, off-site conservation brings new resources by enlisting the aid of seed storage laboratories, botanic gardens, and the research community.

Indeed, off-site conservation can lead to false security if it is not part of an integrated conservation plan. At best, by itself it does little more than conserve genetic material, an activity that has little significance without the context of its habitat. At worst, it can lure us into thinking that we have actually done something for conservation, only to later learn that we cannot germinate seeds in storage or that all suitable habitat has disappeared. The conservation strategy involving *ex situ* methods must be part of an overall plan and not act in a vacuum.

Living collections and other off-site storage methods have their risks. Living collections are far from secure in cultivation (Elias, 1978). Natural mortality and difficulty in maintaining propagated stock make the maintenance of living collections highly challenging if not impossible in the long run. For shorter durations, they may be useful if the context is right. Even more secure methods such as seed storage and tissue culture have their risks, including mutations, mechanical failure, and natural disasters. All methods need to be approached with sound science and humility.

### The Role of Botanic Gardens

Botanic Gardens are relatively new partners for certain aspects of plants conservation. For many years, botanic gardens, particularly the larger gardens with research staff, have participated in research on plant taxonomy and distribution.

The role of botanic gardens does not stop with off-site germplasm storage, however. Specific projects include The Berry Botanic Garden's role is reintroduction of *Stephanomeria malheurensis* (Parenti and Guerrant, 1990) and transplantation of *Penstemon barrettiae* by The Berry Botanic Garden (Guerrant, 1990).

A census of the botanic gardens in the Center for Plant Conservation network working within the region to learn of their off-site collections for the taxa on the list is summarized in Table 5. The botanic gardens referred to are The Berry Botanic Garden in Portland, Oregon, Red Butte Gardens and Arboretum in Salt Lake City, and the Denver Botanical Garden in Denver Colorado.

Of the 173 taxa analyzed in this assessment, 63 are kept in off-site seed storage at these institutions.

The table below gives the number of accessions (seeds or living plants) of rare plant taxa from the Interior Columbia River Basin that are maintained at the Berry, Denver, and Red Butte botanic gardens.

TABLE 5. Number of accessions of rare plant taxa maintained at botanic gardens.

Species	Berry*	Denver	Red Butte
<i>Allium aseae</i>	1		
<i>Amsinckia carinata</i>	5		
<i>Antennaria arcuata</i>	1		
<i>Arabis fecunda</i>		1#	
<i>Artemisia campestris</i> var. <i>wormskioldii</i>	4		
<i>Astragalus applegatei</i>	4		
<i>Astragalus diaphanus</i> var. <i>diurnis</i>	1		
<i>Astragalus mulfordiae</i>	10		
<i>Astragalus peckii</i>	2		
<i>Astragalus sinuatus</i>	6		
<i>Astragalus solitarius</i>	3		
<i>Astragalus sterilis</i>	3		
<i>Astragalus tegetarioides</i>	3		
<i>Astragalus tyghensis</i>	3		
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	3		
<i>Castilleja chlorotica</i>	3		
<i>Castilleja christii</i>		1#	
<i>Chaenactis cusickii</i>	1		
<i>Colloma mazama</i>	2		
<i>Cypripedium fasciculatum</i>	1		

<i>Delphinium viridescens</i>	4		
<i>Erigeron basalticus</i>	1		
<i>Eriogonum argophyllum</i>			1
<i>Eriogonum crosbyae</i>	3		
<i>Eriogonum cusickii</i>	4		
<i>Eriogonum prociduum</i>	5		
<i>Hackelia cronquistii</i>	12		
<i>Hackelia venusta</i>	22		
<i>Haplopappus radiatus</i>	10		
<i>Howellia aquatilis</i>	live plants		
<i>Ivesia rhypara</i> var. <i>rhypara</i>	21		
<i>Lepidium davisii</i>	5		
<i>Limnanthes floccosa</i> ssp. <i>bellingermaniana</i>	2		
<i>Lomatium erythrocarpum</i>	1		
<i>Lomatium suksdorfii</i>	5		
<i>Luina serpentina</i>	4		
<i>Lupinus biddlei</i>	8		
<i>Mentzelia mollis</i>	5		
<i>Mentzelia packardiae</i>	8		
<i>Mimulus hymenophyllus</i>	1		
<i>Mimulus jungermannioides</i>	3		
<i>Mimulus pygmaeus</i>	1		
<i>Mirabilis macfarlanei</i>	39		
<i>Penstemon barrettiae</i>	33		
<i>Penstemon peckii</i>	201		
<i>Perideridia erythrorhiza</i>	7		
<i>Phacelia lenta</i>	3		

<i>Pleuropogon oregonus</i>	4		
<i>Polemonium pectinatum</i>	3		
<i>Primula nevadensis</i>	1		
<i>Ranunculus reconditus</i>	4		
<i>Rorippa columbiae</i>	1		
<i>Senecio ertterae</i>	9		
<i>Sidalcea oregana</i> var. <i>calva</i>	3		
<i>Silene seelyi</i>	4		
<i>Silene spaldingii</i>	23		
<i>Stephanomeria malheurensis</i>	127		1
<i>Tauschia hooveri</i>	1		
<i>Thelypodium eucosmum</i>	2		
<i>Thelypodium howellii</i> ssp. <i>spectabilis</i>		2	
<i>Trifolium leibergii</i>		2	
<i>Trifolium owyheense</i>	5		
<i>Trifolium thompsonii</i>	2		

\* The number of accessions can indicate many things. In earlier years, some accessions from different plants in a population were accessioned together. Later, each plant from a population received a separate accession number.

# Accession is split between the garden and the National Seed Storage Laboratory. May be more than one accession.

This summary information provides a rough estimate at best of off-site activities. Accessions may or not be adequate to represent the genetics of the wild populations. Germination testing has most likely been completed for only a few of the taxa. Although the number of taxa in off-site seed storage is surprisingly high, the "quality" of these collections has not been assessed for most and should not provide a sense of security that these taxa are well-represented off-site.

It would be interesting and desirable to provide a more in-depth assessment of these collections. Appropriate areas of inquiry would be how the off-site collections compare to natural population and their genetic representation, which additional species might be added to off-site storage and in which priority, which species provide challenges for germination and growth, what outstanding taxonomic questions might lead to better conservation action, and what kinds of

research are being carried out in general for life history parameters or restoration/enhancement. We know for example that re-establishment projects are underway for *Penstemon barrettiae* (Guerrant, 1990) and *Stephanomeria malheurensis* (Parenti and Guerrant, 1990) because we are involved directly, however, others may exist that we could learn of with time to inquire. Research on germination and growth of *Hackelia venusta* is being undertaken by the Cincinnati Zoo and Botanical Garden with seeds to be provided by the Berry Garden. Likewise, the Berry Garden is undertaking a long-term soil seed bank study of *Penstemon peckii*.

### Centers of Endemism and Hotspots of Biodiversity

Panelists were also asked to generate a map of areas with high concentrations of endemic species and areas that they felt to be "hot spots" of biodiversity. This exercise was meant to be part of a larger effort undertaken by the Terrestrial group of the Science Integration Team. It was a very subjective effort, with little definition given as to what constituted a hot spot or how to define a center of endemism. Each panel came up with very different results and areas were drawn on several different scales. As such, none of this information has been included in this report and it is strongly recommended that this information from other reports from the ICBEMP project showing hot spots or centers of endemism for plants NOT be used for any type of planning effort.

If this information is desired, the following objective method could be used as a starting point for gathering this type of information. Using State Heritage Program data, and defining endemism to mean areas of high concentrations of globally rare elements, occurrence density maps could be generated for elements of G ranks of G1-3. To get an idea of biodiversity, defined as areas of high concentrations of global and state rare elements, or even state rare elements only, a map of state S1-3 and global G1-3 could be generated. Recent large scale planning efforts have used this method to produce maps that show number of species by county, with a shading to illustrate high density areas. Figures 2 and 3 in this report show this kind of information for the ICBEMP.

## CONCLUSIONS

### MANAGEMENT IMPLICATIONS

#### Summary of threats (natural and management-induced)

Panelists also provided data on the threats to the taxa of rangewide conservation concern within the ICRB. Several species had more than one factor threatening their habitat or viability. This list did not include natural disturbances such as normal fire regimes, climate change or pathogens and pests. Major threats included exotic plant invasion, road construction and recreation. Several threats represent a complex combination of factors such as the invasion of exotic species due to livestock overgrazing, road construction, or increased fire frequency. The table below summarizes the number of vascular plant taxa of rangewide conservation concern that are judged to be at risk from the indicated threat factors.

TABLE 6. Summary of threats and number of taxa affected.

Threat	Number of taxa affected	bryophytes	fungi	lichens
agricultural conversion	16	X	X	X
development	21			
exotic plant species	89			
fire, change in native regime	12	X	X	X
fire suppression activities	24			
fire, increased frequency	4	X	X	X
fire, stand-replacing	1			
fire exclusion	1		X	X
livestock grazing, indirect effects	16	X	X	X
livestock grazing, direct effects	23	X	X	X
hydrological regime changes	18	X		
mining	9			
off highway vehicles	28	X		X
pipelines, power lines	2			

recreation	32	X		X
road construction	37			X
road maintenance	13			X
riparian disturbances	9	X	X	
timber harvest	12	X	X	X
herbicide spray and drift	15			

### **Mitigation measures (standards and guides) to reduce risk to species of concern**

The majority of the vascular plants analyzed as part of the Science Assessment are either locally endemic in their distribution pattern, or have broader distributions but are associated with highly specialized habitats. As discussed in the previous section, determining the effects of management actions on such rare plants is difficult at the broad scale of analysis for the ICBEMP. The viability and conservation of all of these highly restricted taxa, as well as determinations of the effects of management actions on them, is best undertaken at the local, regional or provincial level. Therefore, we have suggested the following mitigation measures (standards and guides) for both the broad scale and project level that may be used in the planning, analysis, implementation and monitoring of projects to insure viability of native vascular plants and bryophytes, lichens, and fungi at all scales of planning. A further management objective is to maintain the distribution of native plant communities throughout the local planning areas, and to maintain, protect, or restore special habitat features (e.g., peatlands, bogs, fens, azonal lithologies, mineralized areas, geothermal areas).

We also recognize the need to develop a process for the conservation of local and regional endemics and disjunct and peripheral species at finer planning scales that will build on the information provided in this document and provide for continued viability of these taxa across administrative boundaries. This may be potentially accomplished at the sub-watershed or watershed level and involve a diverse group of partners such as: USFS, BLM, State Natural Heritage Programs, U.S. Fish and Wildlife Service and Native Plant Societies.

#### **1. Broad-scale inventory needs to assure species viability:**

- ▶ Develop monitoring programs and conservation strategies for local endemic, regional endemic, scattered, disjunct, and peripheral plant species across their geographic ranges. When necessary, collect basic life history and demographic information to assess viability, and make this information available to all project planners.
- ▶ Conduct floristic surveys of azonal habitat inclusions (e.g., rock outcrops, cindercones, roof pendants, serpentine soils). Surveys should focus on both vascular plants and

bryophytes, lichens and fungi. Assure that qualified specialists conduct the surveys for each separate plant group.

- ▶ For each Ecological Reporting Unit (ERU) or physiographic province, conduct inventories for rare lichens, bryophytes and fungi. These surveys shall be conducted by individuals with appropriate taxonomic expertise.
- ▶ Coordinate all inventories and monitoring for bryophytes, lichens, and fungi at a regional level to assure consistency and expertise at the Forest level, where skills in lichen, bryophyte and fungal taxonomy may be lacking.
- ▶ Identify and protect high-quality examples of intact cryptogamic soil crusts and vascular plant communities across the ICBEMP, especially in arid areas at low to mid elevations. Representative stands must be designated in each section of each province in the assessment area. Livestock must be excluded from protected areas. These areas may be designated as Botanical Special Interest Areas or Areas of Critical Environmental Concern.
- ▶ Identify and protect type localities for rare lichens, bryophytes and fungi that occur within the ICBEMP as Botanical Special Interest Areas or Areas of Critical Environmental Concern. These areas can serve as reference sites to aid in identification of potential habitat and positive species identification.
- ▶ Conduct systematic surveys by taxonomic experts to determine the composition and distribution of microbiotic crusts within the ICBEMP assessment area, as such crusts are critical to the ecological integrity of arid plant communities.
- ▶ Encourage systematic surveys by taxonomic experts in peatlands, fens and bogs. Peatlands (including bogs, fens, and shrub swamps) need protection from grazing, commercial collecting, and structural and hydrologic alteration. Basic inventories are needed throughout the assessment area to locate, identify and map peatlands.
- ▶ Conduct systematic surveys of calcareous rock habitats. Representative areas of wet and dry calcareous rock need inventory and protection from mining activities because of their habitat importance to bryophytes and lichens.
- ▶ Assess the conservation status of rare plant species at the margins of their geographic ranges (e.g., species with state ranks of S1 or S2, as determined by the state Natural Heritage Programs). Provide habitat protection measures necessary to assure the continued viability of these peripheral populations.
- ▶ Identify and protect high-quality stands of Garry oak (*Quercus garryana*) woodland occurring in the assessment area. These stands are extremely important habitat for bryophytes and lichens, and harbor the only occurrences of some taxa.

- ▶ Within proposed project areas, survey and map all rare (G1-2) plant communities, if present, and provide for their continued compositional and functional integrity.
  - ▶ Continue to conduct species-specific surveys for rare species of vascular plants and bryophytes, lichens, and fungi with poorly known ranges to determine distributions and abundances and, if necessary, appropriate levels of protection. Assure that qualified specialists conduct the surveys. Incorporate newly acquired information into management decisions such that those taxa in need of protection are provided for.
- 2. Broad-scale mitigation suggestions for maintaining genetic integrity of native communities:**
- ▶ To the extent practicable, seeds and plants used in erosion control, fire rehabilitation, riparian restoration, forage enhancement, and other revegetation projects shall originate from genetically local sources of native species. Follow the regional policies established for U.S.F.S. Regions 1 and 6. When project objectives justify the use of non-local or non-native plant materials, documentation explaining why non-local and non-native plants are preferred will be a part of the project planning process.
  - ▶ If genetically local stock of native tree, shrub, forb, or grass species is not available for rehabilitation or revegetation projects, consider not doing, or delaying the project, or using exotic species that will not persist in the ecosystem. Sterile varieties or short-lived annuals should be specifically considered.
- 3. Broad-scale planning suggestions:**
- ▶ Define existing and suitable unoccupied habitat for TES plant species by mapping locations and describing the habitat requirements necessary for the maintenance of viable populations.
  - ▶ Establish conservation agreements and prepare conservation strategies to preserve habitats of sensitive plant species as a means of preventing further federal listings.
  - ▶ Establish partnerships and cooperate with native plant interest groups, other agencies, and private land owners in programs for assuring the long-term survival of TES plant species.
  - ▶ To assure the continued harvestability of Native American culturally significant plant species, these taxa must be identified and their biology and protection considered in the planning and implementation of projects.
- 4. Broad-scale monitoring and research suggestions:**

- ▶ Determine what species of vascular plants, lichens, bryophytes, and fungi are being harvested commercially within the assessment area, and determine what impacts harvest will have on species viability. Formulate plans to monitor permit and harvest activity to protect species viability and diversity. This should be regionally coordinated to assure viability across the range of these species.
  - ▶ Establish a program of monitoring and evaluation to determine the direct, indirect, and cumulative effects of management activities on the continued survival of viable populations of TES plant species occurring within the appropriate planning areas.
  - ▶ Select appropriate vascular plants and bryophytes, lichens, fungi, or groups of plant species that are sensitive to changes in habitat and ecosystem conditions, for use as management indicators.
  - ▶ Assess the conservation status or needs of rare plant species at the margins of their geographic range. Provide habitat protection measures necessary to assure the continued viability of these peripheral populations.
  - ▶ Coordinate all inventories and monitoring for bryophytes, lichens, and fungi at a Regional level to assure consistency and expertise at the Forest level, where skills in non-vascular plant and fungal taxonomy may be lacking.
  - ▶ Encourage partnerships with outside research organizations to address identified information needs, especially basic life-history information, for high-priority species of conservation concern.
  - ▶ Provide training opportunities to improve knowledge of monitoring and data collection methods necessary to meet monitoring standards.
- 5. Forest or project-level mitigations to be incorporated in the design, planning and implementation of projects:**
- ▶ Amend Forest plans to implement existing recovery plans and conservation strategies for Federally listed vascular plants and bryophytes, lichens, and fungi and species of conservation concern.
  - ▶ Conduct species-specific and/or floristic surveys for rare species of vascular plants and bryophytes and fungi for all agency-sponsored activities. Assure that qualified specialists conduct the surveys.
  - ▶ Assess the conservation status or needs of rare plant species at the margins of their geographic range. Provide habitat protection measures necessary to assure the continued viability of these peripheral populations.
  - ▶ Prescribed fire plans should consider the phenology and condition of native plant

communities, and occurrences and phenology of TES plant species, in determining suitable timing and intensities of burn treatments.

- ▶ Recreational planning should include adequate consideration of biological impacts to native plant communities, including associated long-term effects. Evaluate and reduce, where necessary, the impact of dispersed recreation on rare plant sites through a program of public education and interpretive displays, and relocation of recreational sites where appropriate.
  - ▶ To assure the sustainable harvestability of Native American culturally significant plants, these taxa must be identified and their biology and protection considered in the planning and implementation of projects.
6. **Recommendations specific to bryophytes, lichens, and fungi, including: those occurring on specialized substrates that are identified within the planning area and inventory and research needs.**

### **Bryophytes**

Appendices in Christy and Harpel (1995) list specific localities, habitats and research needs for bryophytes in the study area. The data for Nevada and Utah are scanty. Despite the fact that thousands of collections of bryophytes and lichens have been made in the Columbia River Basin over the last 150 years, vast areas have not been collected systematically or at all. In particular, liverworts have been undercollected and chronically misidentified, and need careful attention in future work.

- ▶ **Surveys for rare species.** Obviously, the rare taxa listed in the reports need to be sought throughout the study area, to better determine distributions and abundance. The localities of the taxa listed as occurring at the edge of their range (e.g., species primarily of eastern North America) are important for study for their role in migration or as relictual areas. Habitat needs for specific species are beyond the scope of this report.
- ▶ **Arid habitats and soil crusts.** Arid habitats of all types are undercollected and need further attention throughout the region. These include desert, shrub-steppe, pinyon-juniper woodland, oak woodland, and ponderosa pine forest. The composition and function of soil crusts, while relatively well studied in the Great Basin, particularly in Utah, is virtually unknown in the Columbia River basin. Some general collecting has been done in a few areas, but the problem needs to be approached on a regional basis, studying crusts in different plant associations and on different soil types. The effects of livestock trampling should be included in any such studies.
- ▶ **Old-growth and late-successional forests.** Most of the issues identified in Thomas et al. (1993) also apply to forested areas of the Columbia River Basin and need not be

repeated here. The greatest similarities in the bryophytes flora and relative biomass in these forests occur in the mesic forests of the so-called "maritime extension" area in Idaho and Montana. Commercial harvest of moss in these forests is a growing concern, and needs regulation and monitoring to ensure that rare or disjunct species are not being depleted, and that recruitment is adequate to sustain harvest levels. Ponderosa pine forests have few bryophytes as epiphytes or in the understory, but representative stands need to be protected and managed correctly to maintain floristic composition.

- ▶ **Calcareous rocks.** Calcareous substrates provide habitat for a distinctive group of bryophyte species. A few calcium-rich areas have been collected, particularly in the northern Rocky Mountains and elsewhere in Idaho, but those of Oregon and Washington are poorly known and need further work.
- ▶ **Mineralized areas.** Mineral deposits, usually occurring in areas previously mined for gold, silver, copper, mercury and other materials, often provide substrate for a distinctive group of bryophytes. While these areas have received some attention in the Rocky Mountains, other sites within the study area have not been surveyed adequately for these species. It is the same sulfides, especially in mine runoff, that pollute streams and groundwater. Mine tailings and debris undoubtedly have increased suitable habitat for some of these species, which often favor disturbed or barren soils.
- ▶ **Peatlands.** Until recently, wetlands were much ignored by land managers, and there is not a good history of collecting in these sites except by a few individuals. With the advent of wetland fill regulations and community classifications, they are receiving more attention and some records now thought rare should become more common. Included in this category are bogs and fens, the latter occurring on calcium-rich sites, which have been poorly-collected outside of the Rocky Mountain region. Impacts from grazing in peatlands have received little attention in the Pacific Northwest, but observations suggest that bryophytes are severely impacted by trampling, as noted in the wet soil group.
- ▶ **Floodplains.** These habitats have received recent attention because of wetland and riparian protection. Thomas *et al.* (1993) identified how important floodplains were for bryophyte species diversity, and how many species, particularly liverworts, were concentrated in old-growth forests occurring there. A similar situation exists in the Columbia River basin, especially in the "maritime extension" areas of Idaho and Montana, where species depend on shade, wet soils, logs and other organic debris, and humid microclimate. As with the aquatic and splash zone species in streams, this group of species can be affected to some degree by land ownership patterns and adverse conditions originating upstream on non-federal lands, although impacts would be less pernicious because few of these species are in the stream channel. The effects of livestock trampling should be included in any such studies.
- ▶ **Geothermal areas.** Geothermal areas are sometimes known for unusual assemblages of plants that survive outside of their normal distributional limits, because heated ground

provides snow-free conditions and a longer growing season (Lange 1973, Given 1980). Although many bryophyte specimens were collected from hot springs in Idaho and Montana, none appear to be restricted to this habitat on a regional basis, or to exhibit an unusual distributional pattern. Eversman (1990) found lichens to be absent from geyser areas, presumably because of particulate matter and sulfurous fumes from geysers, but the flora was more normal near thermal springs. More work needs to be done in these areas to better describe their effects on bryophytes.

- ▶ **Isolated gorges and narrow canyons.** Steep, narrow canyons provide ideal conditions for bryophytes to persist in areas outside their normal distributional limits. Shade, moisture and cold air drainage all contribute to unusual species being found in these areas, sometimes as relics from cooler periglacial climates. Impacts from livestock and humans are often limited here because of restricted access. More work needs to be done to inventory such sites, particularly those with historical bryological collecting that can be used for comparative purposes to monitor changes in the flora.
- ▶ **Rivers and streams.** Aquatic and splash zone bryophytes are subject to the same impacts described in Thomas *et al.* (1993), and need not be repeated here. Galvanized culverts, like roof flashing, may be toxic to aquatic bryophytes and may diminish species diversity on some streams.

#### **Program needs:**

- ▶ **Training for identification and management.** Agencies need to implement programs for training of field personnel to survey and manage for bryophyte, lichen, and fungal species. The limitations are essentially the same as those identified in Thomas *et al.* (1993). There are few bryophyte, lichen, and fungal taxonomists in the region and very few individuals are now being trained in universities.
- ▶ **Typification of flora by plant association.** Despite the great strides taken by regional U.S.F.S. ecology programs over the last twenty years to classify vegetation by plant association, no effort has been made to include bryophytes or lichens in plot data. A vast amount of habitat-specific information, with implications for management and distributional studies, could be obtained by including these plants in the classification scheme. Again, a lack of bryological and lichenological training for ecologists is the principal reason for this shortcoming.
- ▶ **Inventory of protected areas.** Research Natural Areas, ACEC's, wilderness areas, riparian zones and other administratively protected areas should be inventoried for bryophytes, lichens and fungi. Crater Lake National Park has been poorly collected, in contrast to Glacier, Yellowstone and Grand Teton National Parks, which have been collected heavily since the 1870's. Baseline data should include bryophytes to identify distributional and management issues, and to provide a historical basis to monitor future trends of the bryoflora.

## Lichens

Lichens are an important component of forests and rangelands of the Columbia Basin. Yet basic knowledge about these species and their interactions are limited. Therefore, baseline inventories to document lichen species presence, abundance, biomass, habitat requirements, and geographic distribution is needed. Inventory data needs to be incorporated into the general biological inventory efforts, computerized and mapped. Standardized methods for the sampling of forest

epiphytes needs to be developed. This data should be verified with voucher specimens deposited in recognized regional herbaria. From this information identification guides and annotated catalogs for lichens in each physiographic region should be developed.

Status survey reviews should be conducted for the rare lichen species. This information needs to be shared with the State Heritage Programs in each State to complement information from private and State lands. Conservation strategy plans should be developed for these rare species to conserve and enhance their populations.

Successional studies should be conducted of lichens, including their establishment, diversity and abundance in stands of different ages and different plant associations, substrates, and vertical succession. Conduct basic and applied research to determine lichen dispersal patterns by species, groups of species, by forest types, and recovery after fires.

Develop monitoring and research plans to evaluate the effects of forest and rangeland management practices on lichens. Monitor the impacts from management activities including timber harvesting, silvicultural practices, grazing, and recreation. For example, what species of lichens are retained in retention trees by topographic position, tree symmetry, crown type, or aggregation of the retention trees? What is the advantage of selecting leave trees that contain a diversity of lichen species and do these lichens on retention trees act as centers of dispersal for those species?

Determine nitrogen fixation rates of the lichens in the microbiotic crusts in different rangeland cover types. Determine the quantity and nutrient content of lichen litter-fall in the forest cover types. Develop a research project to address the role of lichen, through-fall and litter-fall in the nutrient cycling and biomass production of the various types and ages of forests. Conduct research into the role of small mammals (flying squirrels, and boreal red-backed voles) eating lichen litter-fall and its role in the trophic dynamics of small mammals and their predators such as, the boreal owls. Conduct research into the species preferences of lichens for nest building by flying squirrels. Conduct research on the role of lichens as habitat and food for forest invertebrates.

Develop an integrated, regional air quality monitoring program using lichens as biological indicators of forest health, including impacts on lichen species and trends in lichen populations.

Alectoroid and cyanolichens are especially sensitive to air pollution, and should be monitored to detect impacts to viability from a decline in air quality.

## Fungi

The following are presented as ideas in need of further discussion and elaboration but all have a bearing on the quality of this report and the resulting assessment.

The foundation of data on which this report is written is limited because only a few herbaria were contacted for information and of the information contributed much was lacking by way of specific ecological and locational information. The distinct lack of computerization of collections in herbaria was a significant impediment to this work. The mycological community is in a transition stage of accomplishing this work but it will be a few more years before herbarium holdings are readily accessible. As more and more data on extant collections become available these data will need to be incorporated to update this report.

The data gathered for this study were from collections that were the result of systematic research, not ecological research. Taxonomic studies such as these have an emphasis on sporocarp morphology. As such much data on habitat structure is lacking and locations are often vague, i.e., from Priest River. None the less the data shows trends and offers direction for areas of special concern as emphasized in the endemism section. Additional education of members of mycological societies and clubs to include more comprehensive locational and habitat information will facilitate more accurate assessment of fungal organisms for a variety of purposes.

Numerous fungal species have significant nomenclatural difficulties and some contain species complexes. Specific taxonomic effort on these groups or individuals will reduce uncertainties concerning CRB populations and extralimital populations.

Certain fungal species, especially some *Boletus*, *Morchella* and *Cantharellus* species, are important to recreational and commercial gatherers. Some effort to elucidate the ecological parameters and specific biology and life history of these species is critical for long term management of this resource in the region.

Extensive fungal surveys are critically needed because the fungal flora of North America is poorly known or understood. It has been common in the past to rely on published descriptions, often poor ones, from the literature on fungi found in Europe and then to identify specimens in North America with keys and descriptions developed for Europe. It is now more readily apparent that overlap between species from Europe and North America is much more minimal than traditionally thought for mycorrhizal species and for saprophytic species. A modern reassessment of all fungal species from North America that carry "European" names is called for, particularly the those mycorrhizal species associated with specific hosts.

Many collections were made prior to major changes in vegetation due to forest timber harvesting

over the last thirty years. Retrospective analysis is needed for vegetation associations at time of collection.

Identification of extant specimens are not always correct due to non-expert identification prior to placement in the herbarium. Non-expert identification is a product of lack of trained professional mycologists. The last decade has seen many classical (alpha-taxonomy) mycologist positions in universities across North America become positions with a strong if not sole focus on molecular biology. This has led to a severe backlog in accession and curation of fungal specimens. This is compounded by the lack of modern species concepts and critical assessment of species complexes.

The CRB is an extremely large geographic area with an extreme diversity of habitats from alpine to desert. The complexity of the landscape makes assessment for rare fungal species extremely difficult. Of special consideration are riparian areas because of the high diversity of ectomycorrhizal hosts found in these habitats. In addition the CRB has vast areas of habitat (soil types) that are restricted in distribution that have not been explored to any degree.

Lack of specific knowledge on the function or role that each fungal species plays in the ecosystem besides that of a general saprophyte or mycorrhizal symbiont. The specific physiological functions of different fungal species even within the same genus can be marked. Effects of management activities on all species are unknown.

Information on population viability of listed fungal species does not exist. We therefore cannot make inferences on the effects of management activities on population trends except in the general category of mycorrhizal fungi which depend upon a host plant for survival. Removal of the host will negatively impact the mycorrhizal fungus or the saprophyte that is host specific. Effects of landscape fragmentation of dispersal is also unknown.

Due to the ephemeral nature of the sporocarps and the strong dependence on abiotic factors for sporulation, such as precipitation, fungal species community analysis requires five to ten years of collecting to adequately and comprehensively assess any one area. We also have no data on shifting or movement through the soil matrix of fungal populations. A particular fungal colony may or may not migrate through hyphal growth over time, i.e. decades.

A number of species are phenocoid, fruiting after fire, these species need specific study on the effects of fire intensity on sporocarp phenology.

Species that fruit on or in dung are transitory by nature. Spores are either deposited on vegetation which is then consumed by animals or deposited on dung after deposition. In either case the dung is necessary for completion of the fungal life cycle.

Many of these fungi, both mycorrhizal and saprophytic, are somewhat to extremely dependent on plant host species, effort is needed to protect the site as well as the plant association occupying the site.

Some form of protection of type localities of fungal species should be incorporated into the plan. Type localities are specific locations for specimens that were used to describe this species for science, as such they are important historically. Protection should more often than not be in the form of a mycological preserve of varying size depending on habitat and life history of the species.

Biological and ecological information on macrofungal species is generally lacking. A more useful but not fully satisfying alternative is to manage the habitats where fungi of special concern occur or are likely to occur, particularly habitats that are threatened

**7. Recommendations specific to bryophytes, lichens, and fungi, including: those occurring on specialized substrates that are identified within the planning area.**

- ▶ Aquatic. Protect high quality, intact riparian zones and wetlands from siltation and in-stream disturbance. Provide tall tree retention and connectivity to uplands habitat.
- ▶ Decayed wood. Retain decaying wood in riparian areas and associated stream terraces for bryophytes, especially liverworts. Bryophytes in this group have the best recovery prospects in riparian and associated stream terraces, where decaying wood is best developed.
- ▶ Epiphytic. Epiphytic lichens, bryophytes, and fungi are best expressed in moist to cool forest types, especially along streams. Riparian zone buffers will provide adequate protection in all alternatives for this group.
- ▶ Humus and duff. Practices minimizing disturbance to the ground layer will benefit bryophytes in this group. Curtailment and monitoring of commercial moss collecting is recommended.
- ▶ Dry soil. Microbiotic crusts need protection in representative stands on all soil types to provide reserves for study of floristics, biology and management alternatives.
- ▶ Wet soil. Lichens, bryophytes, and fungi that occur on wet soils can be protected by riparian buffers and other wetlands protections.
- ▶ Snags. As snags are critical for the continuation of epiphytic lichens, and once fallen provide habitat as decaying large logs for bryophytes, set a limit on the upper size of fire wood at 18" diameter at the base.
- ▶ For continuation of lichen habitat, "leave trees" and snags should have a diversity of form, composition and substrates for lichens to colonize. In the moist provinces with a maritime influence, these trees should also be clustered to create a better microclimate.

## ADDITIONAL ANALYSIS NEEDS FOR THE ICBEMP

### 1. Species that need additional broad-scale analysis prior to broad-scale decision implementation.

Based on the draft alternatives that were available during March, 1996, the final vascular plant expert panel determined that 28 of the 173 plant taxa of rangewide conservation concern could be analyzed as to the effects of the alternatives on these taxa at the broad scale. The panel further determined that, given the current information content and level of specificity of the alternatives, effects of management activities on the remaining 144 taxa could be reasonably addressed only at finer planning scales (e.g., Forest Plans, BLM LMPs, sub-basin analysis or ecosystem analysis at the watershed scale). Though it was crucial that the effects of management actions be considered across the range of these species.

As stated in the Introduction to this document, most of the analysis presented here applies to terrestrial vascular and non-vascular plants. The level of analyses for the terrestrial taxa greatly exceeds that for the aquatic plants. This is due in part to the amount of data available. At this time there is no list of algae for which there may be conservation concerns and information on aquatic macrophytes is incomplete. It is recommended that additional aquatic plant work include: analysis of the effects of aquatics as noxious weeds, development of mitigation measures for protection of aquatic plant habitat, completion of a full list of aquatic vascular and non-vascular plant species of conservation concern in the ICBEMP and identification of locations, habitat and threats.

### 2. Proposed processes for gathering additional data.

Should the alternatives in the DEISs be changed, a revised effects analysis may be necessary for the plant taxa of rangewide conservation concern, depending on the nature of such alternatives. If they are specific enough as to proposed implementation, a larger percentage of the 173 taxa of concern could possibly be addressed at the broad scale of the assessment. Several proposed processes have been suggested within the previous mitigation section for vascular plants and bryophytes, lichens and fungi. It is critical to remember that the data used for these analyses are based predominately on field data that was collected prior to the scientific panels conducted in Fall 1994. We have limited our consideration of new data to federally listed taxa because of the scope of the project. This list of taxa of rangewide concern may not reflect the most recent range extensions and discovery of new occurrences and threats.

## SUMMARY

Of the 173 vascular plant taxa found to be of conservation concern on a rangewide scale, and whose ranges lie wholly or partially within the ICBEMP assessment area, the analyses discussed above revealed that 25 of these occur broadly enough within the CRB, or are associated with common vegetation types, such that the effects of the Draft EIS alternatives on the viability of these taxa could be estimated. Three taxa that are federally listed were also evaluated with

respect to the alternatives even though their distribution does not otherwise lend them to a broad scale analyses. One additional federally listed threatened species, *Spiranthes diluvialis*, Ute ladies'-tresses, was discovered within the ICBEMP analysis area in August, 1996 in Idaho and the potential effects of the alternatives on this newly discovered species have not been determined with respect to the Draft EIS alternatives. If no further information is available from the alternatives regarding specific management activities, then the potential effects of management activities on the remaining 144 taxa of rangewide conservation concern would be best addressed at a finer planning scale that is commensurate with the distribution of the taxa concerned (Forest, Provincial, Regional or state level) by resource experts most familiar with these taxa.

During the implementation of management activities, specific mitigation measures for restricted plant occurrences are best designed on a project-level basis. Site-specific mitigation is typically accomplished by changing the temporal or spatial characteristics, level of intensity, or methodology of the project. For example, the effects of livestock grazing or prescribed fire can be minimized or eliminated by timing the activity to fall outside critical periods of the species' life history (e.g., to avoid blooming or fruiting periods). Using the lists provided in the bryophyte, lichen and fungi reports and in Appendix 2 and 3 of this report, begin to consider the effect of activities on these taxa identified as having conservation concerns.

For those species whose viability may be at risk, the key considerations, when detailed demographic monitoring data are not available, include, but are not limited to:

1. the relationship of the species to vegetation succession under various disturbance regimes
2. the sensitivity of the habitat relationship; is the species highly restricted to one habitat type or is it less specific in its requirements.

Important geographic considerations are aimed primarily at the retention of the distribution of the species (i.e., whole populations or subpopulations where the species has a patchy distribution in the analysis area). This approach should be able to maintain underlying population and metapopulation structure, genetic variation patterns, demographic processes, and other less-easily analyzed aspects of population viability.

Given the broad goals of the ICBEMP scientific assessment, the Vascular Plant Task Group analysis represented a pioneering effort to integrate management and conservation of vascular plants into a basin-wide, biologically comprehensive approach to ecosystem management. This analysis uniquely spans government jurisdictional boundaries, and involved numerous federal, state, and local agencies and private organizations having an interest in plant conservation. Though it is tempting to state that the scale of the ICBEMP is not an appropriate level to consider management and conservation of many rare plants, this analysis and the contributions of those across the interior Columbia Basin to this synthesis prove otherwise.

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## APPENDIX 1

### Range Maps for Species of Conservation Concern

APPENDIX 1  
Range Maps for Species of Concern

APPENDIX 2  
List of Species Conservation Reports

APPENDIX 3  
Rare Species Habitat Group Analysis

APPENDIX 4  
Rare Plant Communities

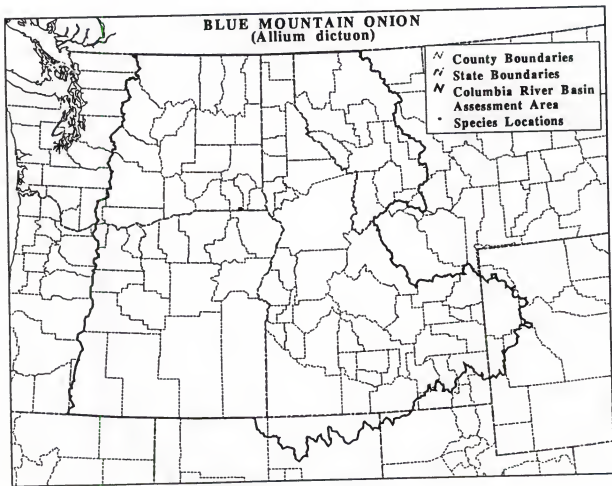
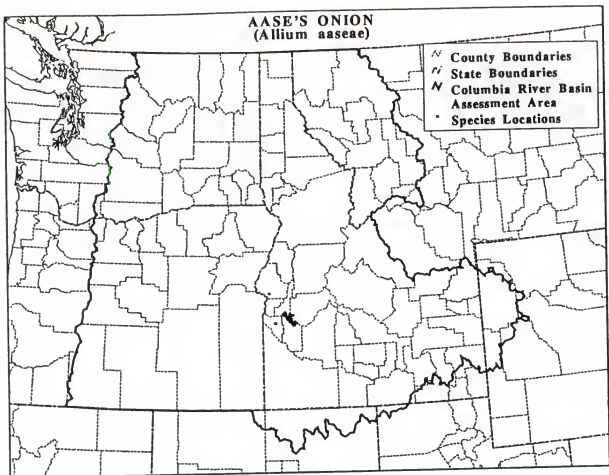
APPENDIX 5  
Plants of Cultural Importance

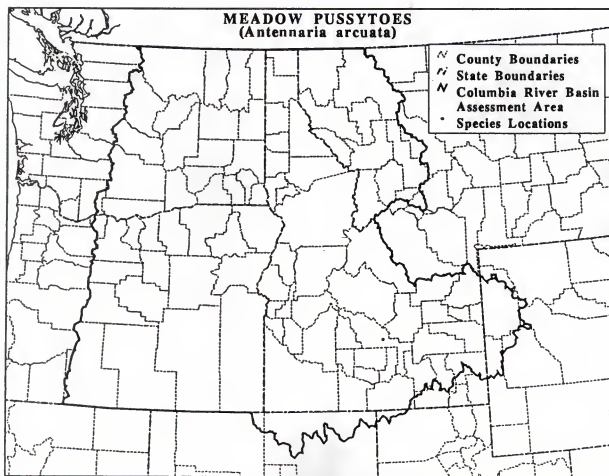
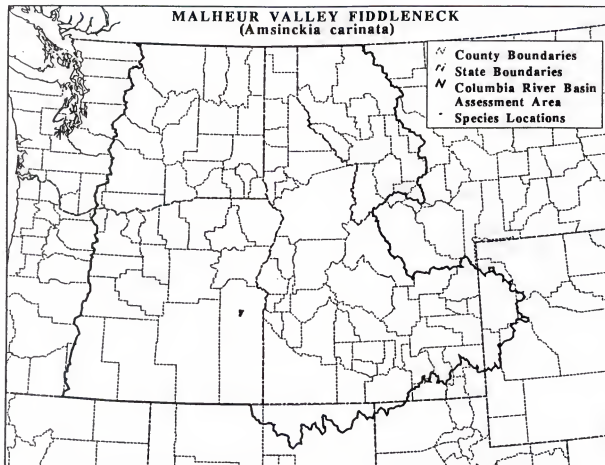
APPENDIX 6  
Research, Development, and Applications Database

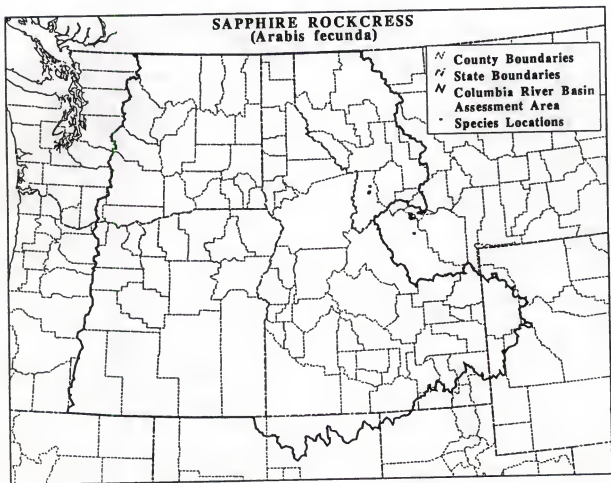
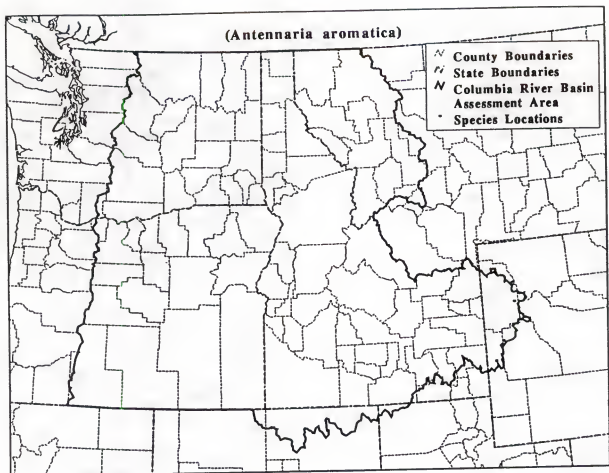
APPENDIX 7  
Checklist of the Vascular Flora of the Interior Columbia River Basin

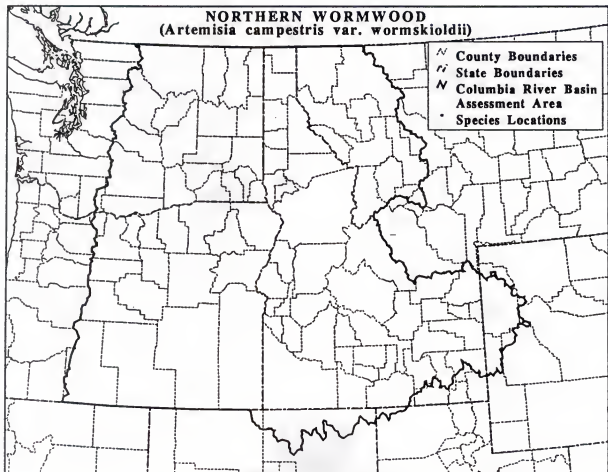
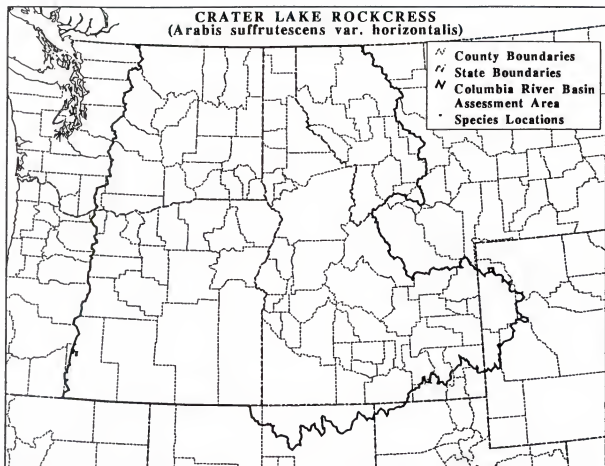
These range maps were compiled from data from State Heritage Programs in Oregon, Washington, Idaho, Montana, Wyoming, Utah, and Nevada. This information represents what was known at the end of the 1994 field season. These maps may not represent the most recent information on distribution and range for these taxa but it does illustrate geographic distribution across the assessment area. For many of these species, this is the first time information has been compiled on this scale. For the continued viability of many of these taxa, it is imperative that we begin to manage for them across their range and across administrative boundaries.

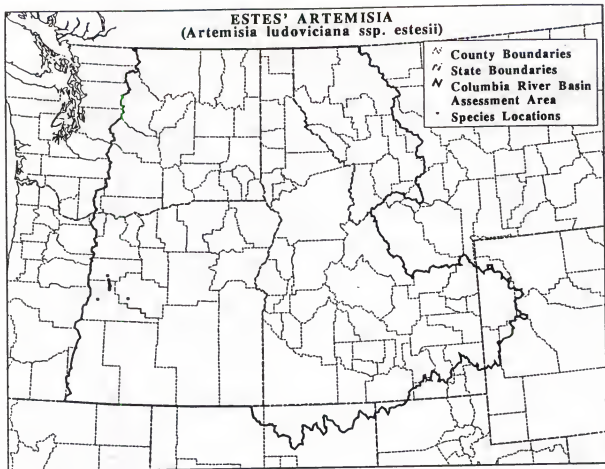
Of the 173 taxa analyzed, there are maps for 153 taxa. For those taxa that were not tracked by heritage programs, we were not able to generate range maps.

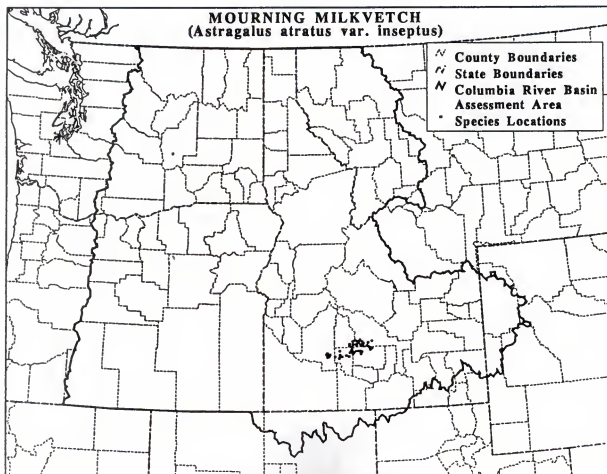
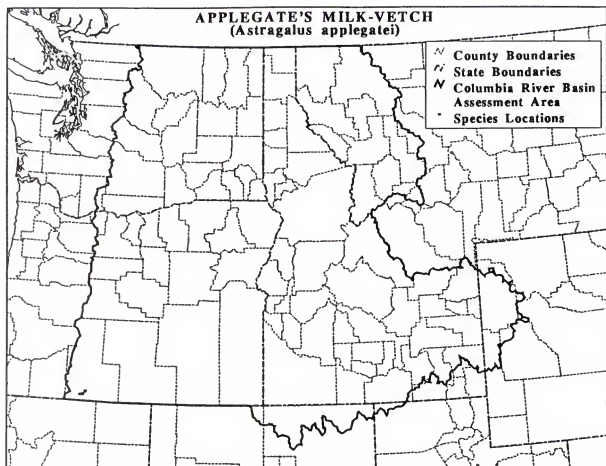


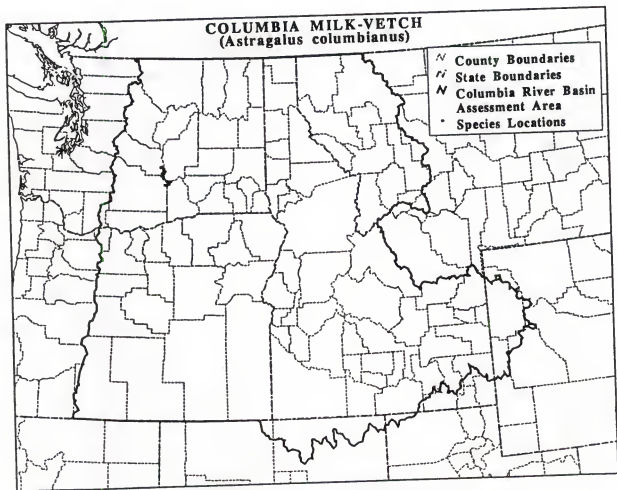
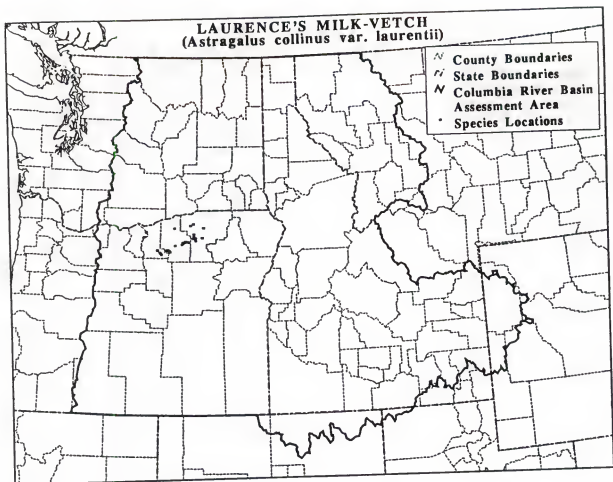


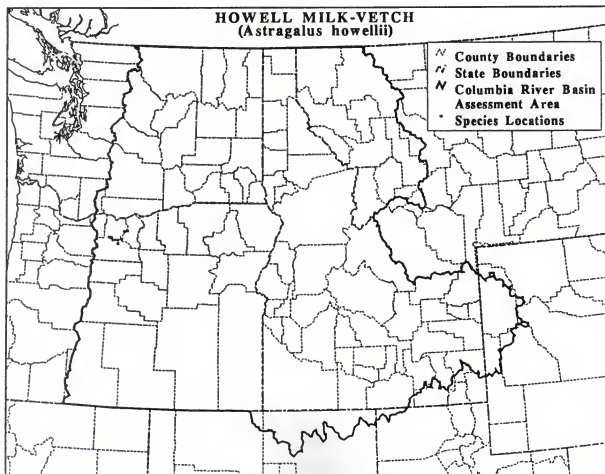
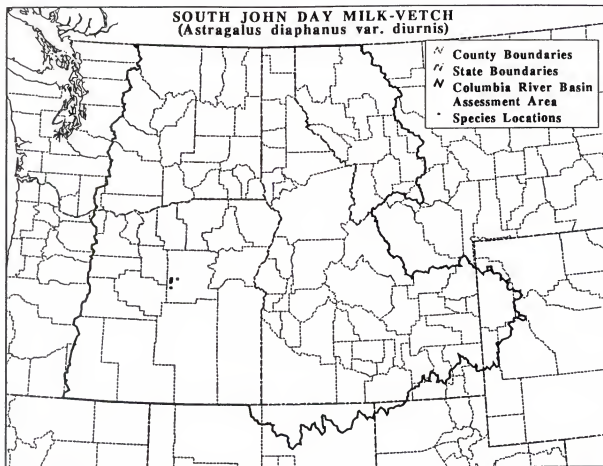


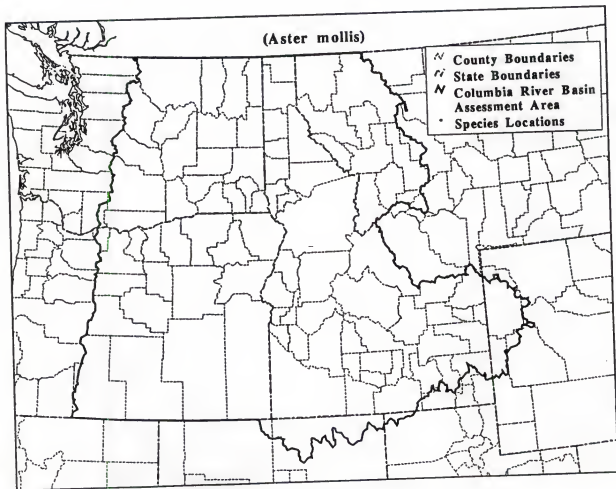
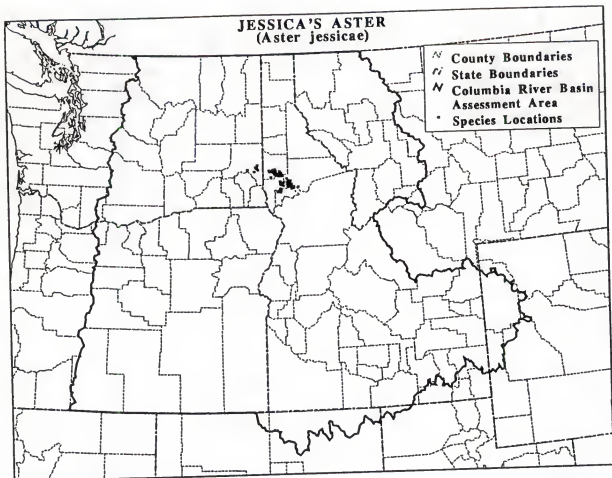


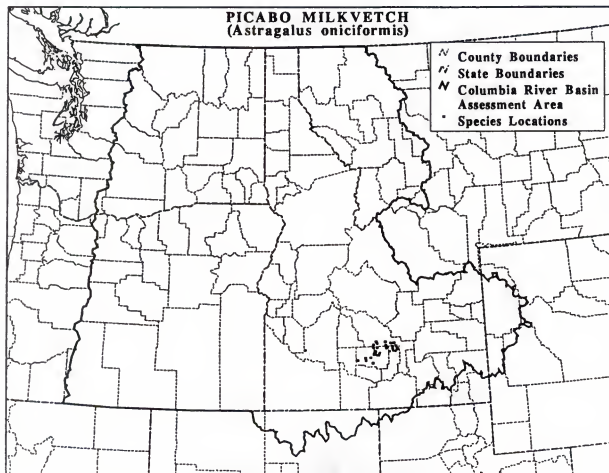
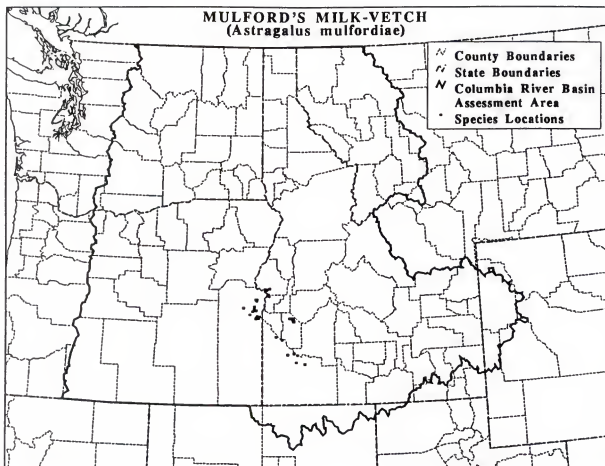


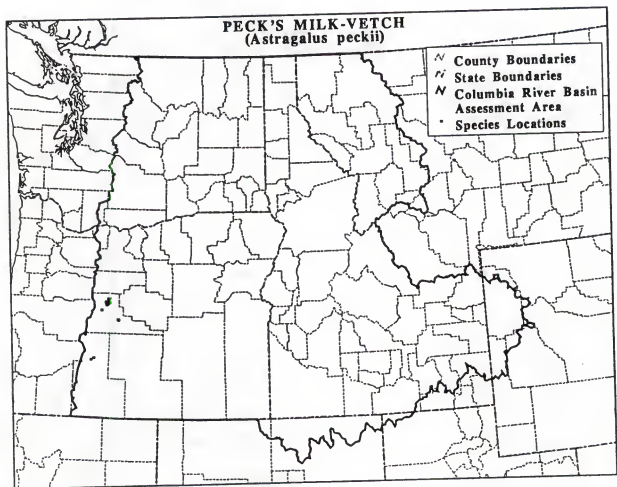
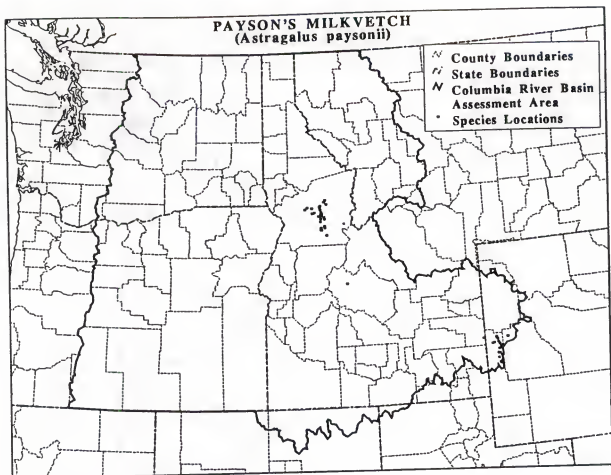


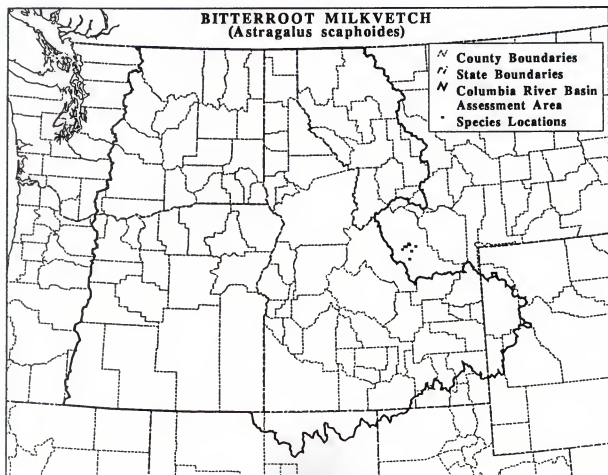
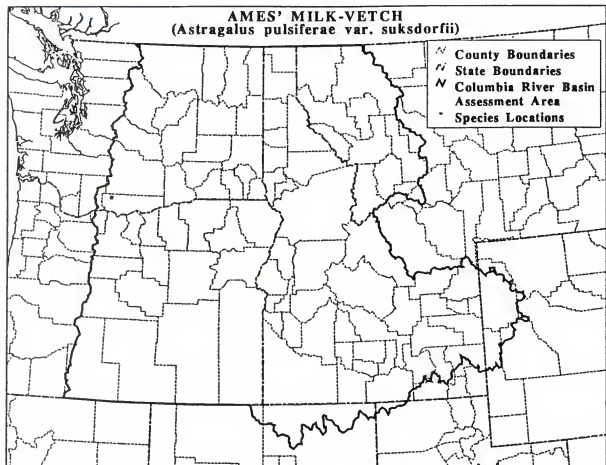


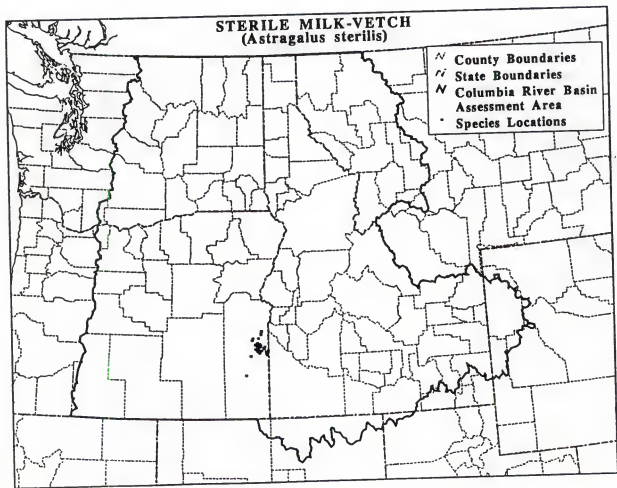
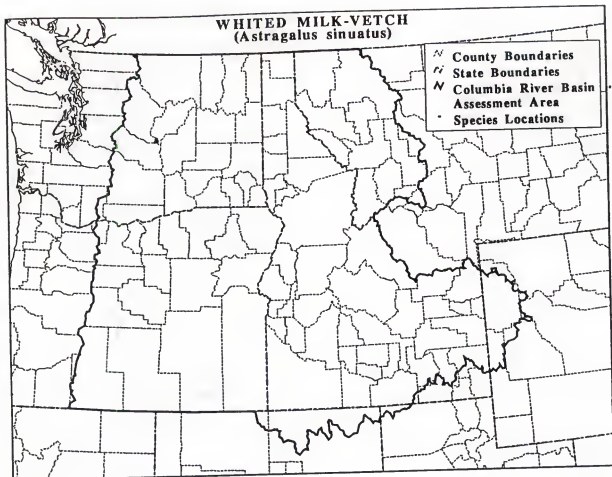


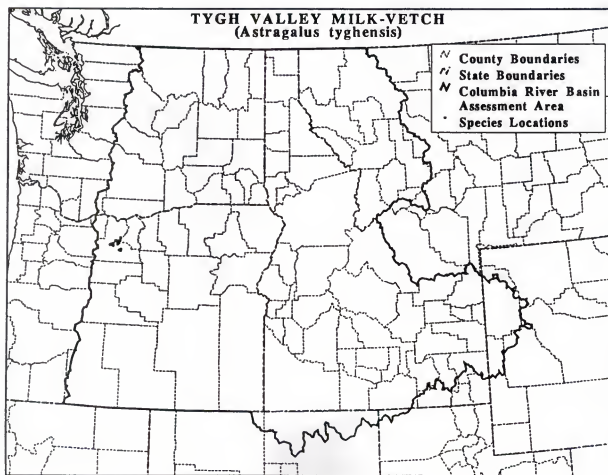
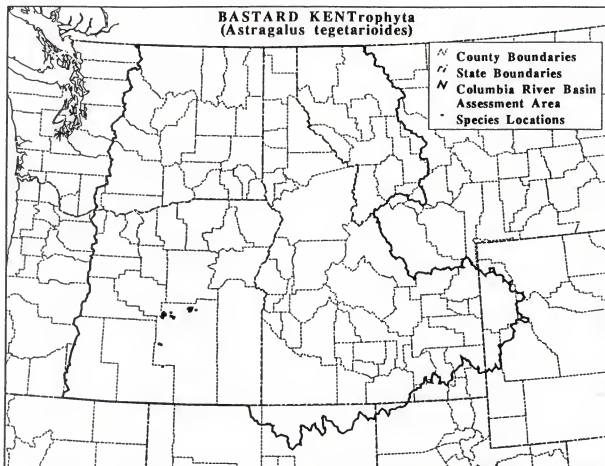


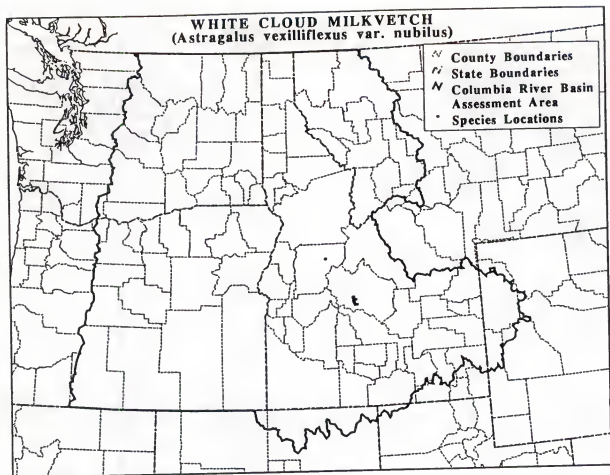


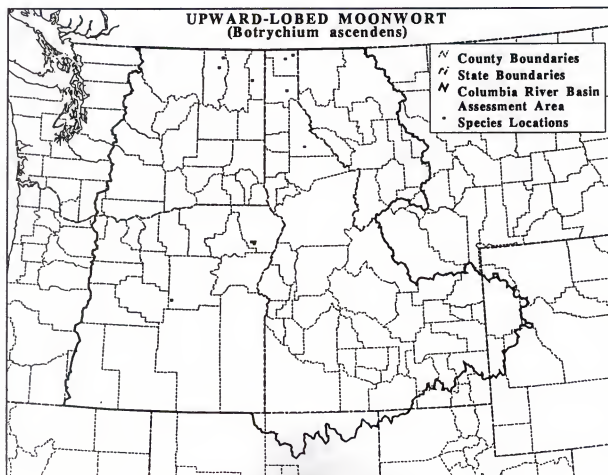
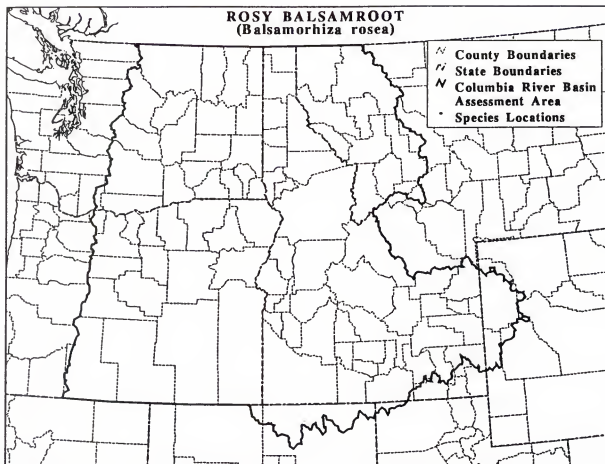


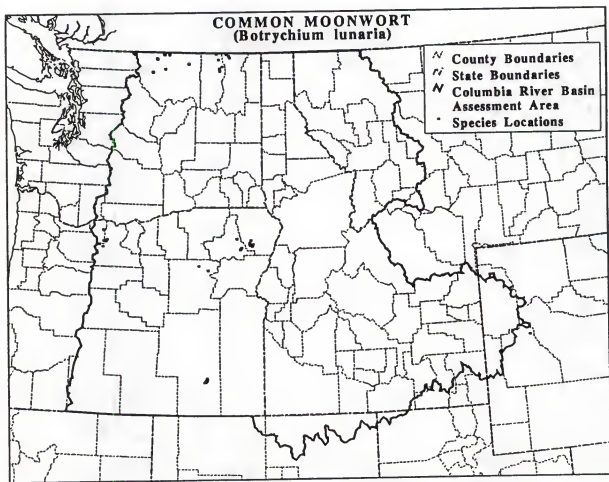
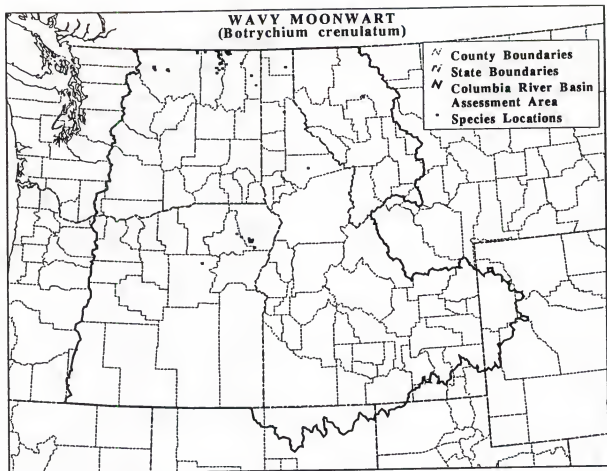


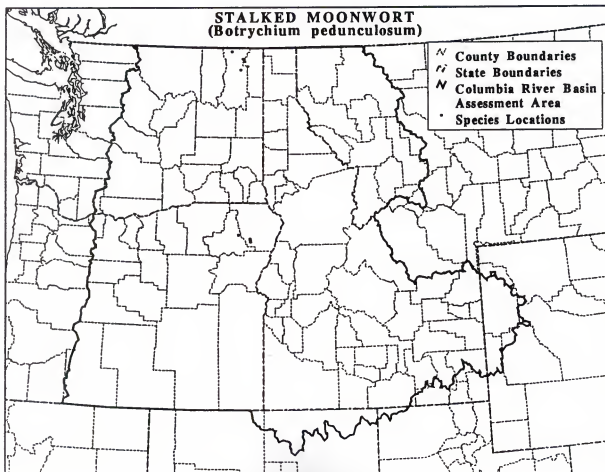
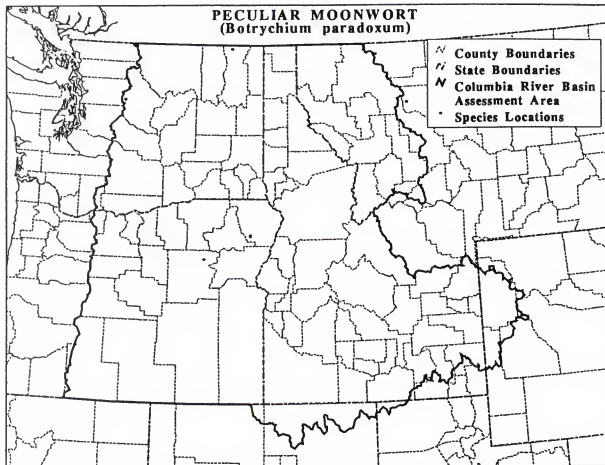


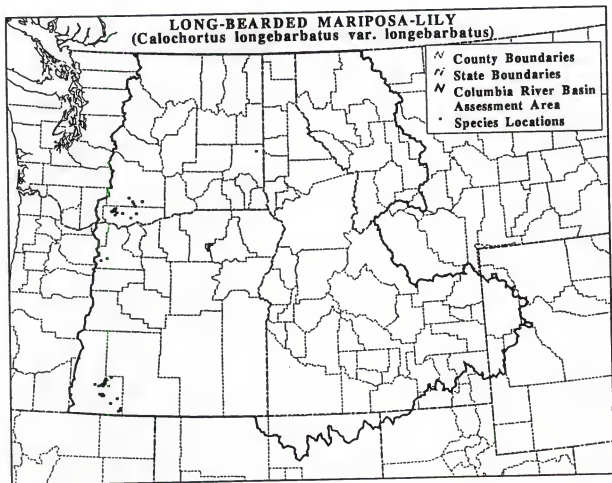
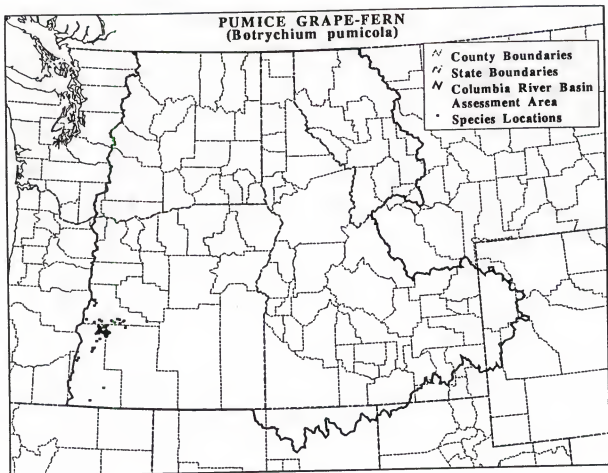


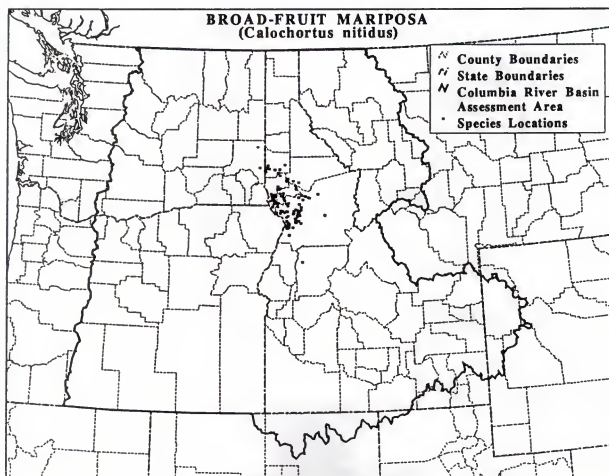
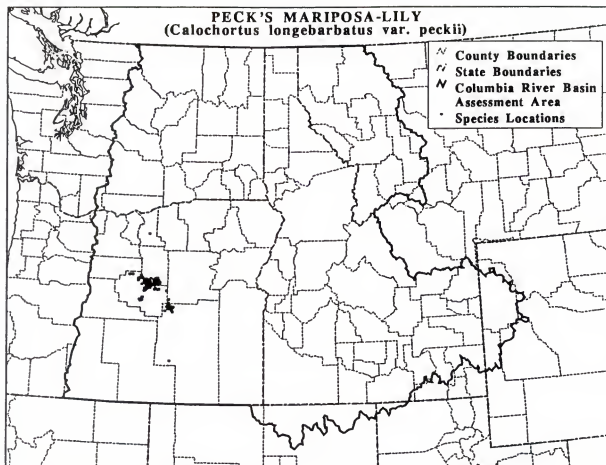


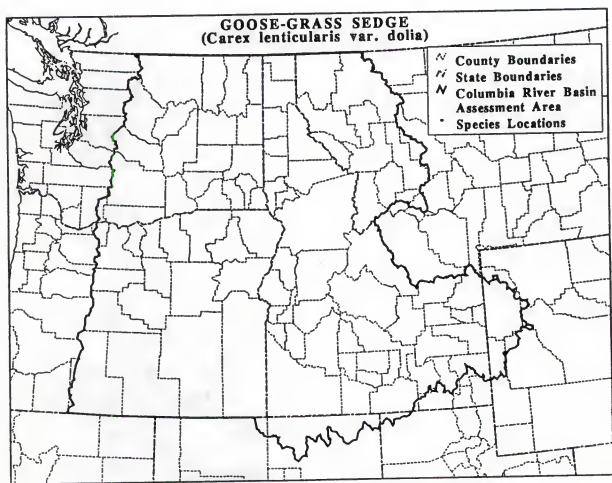
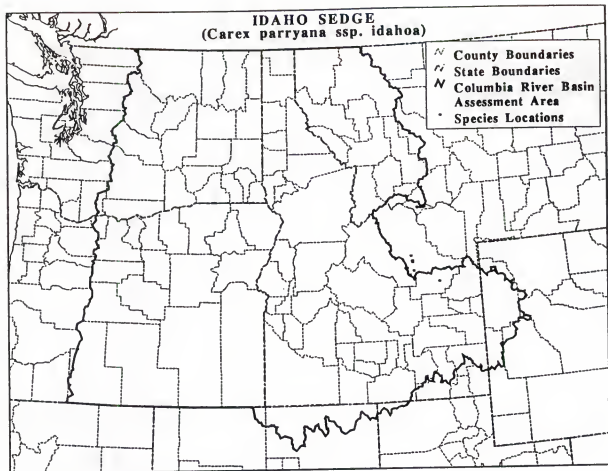


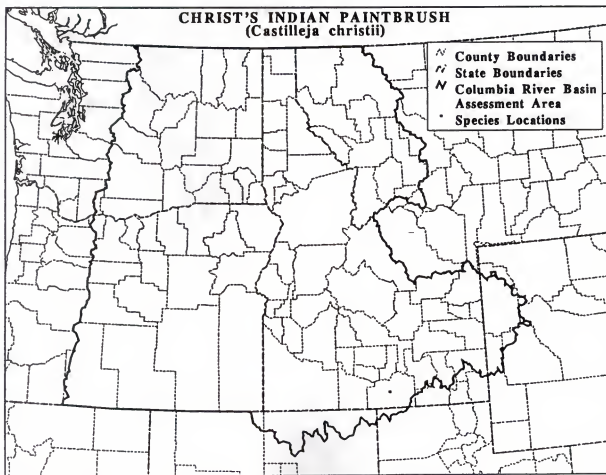
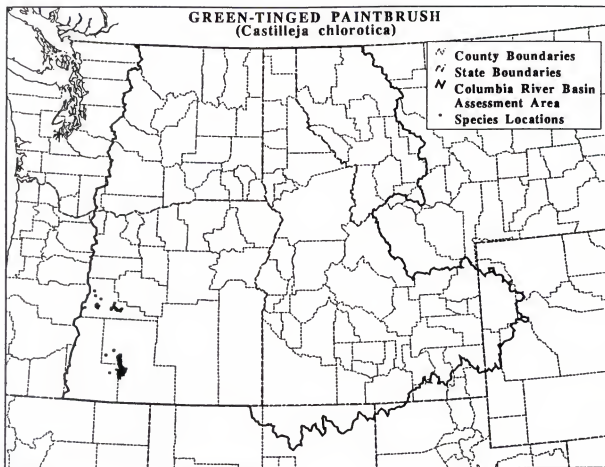


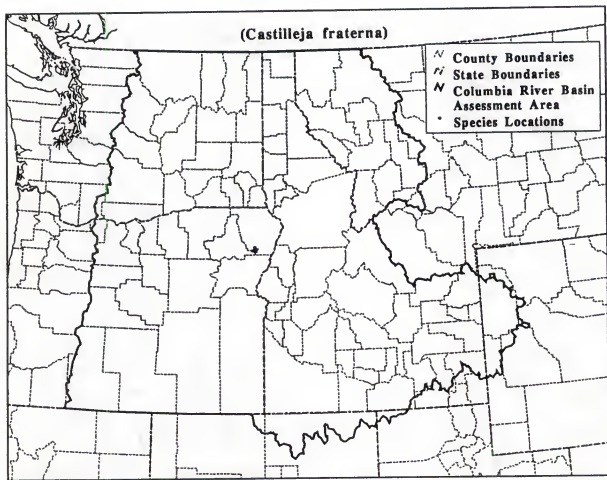
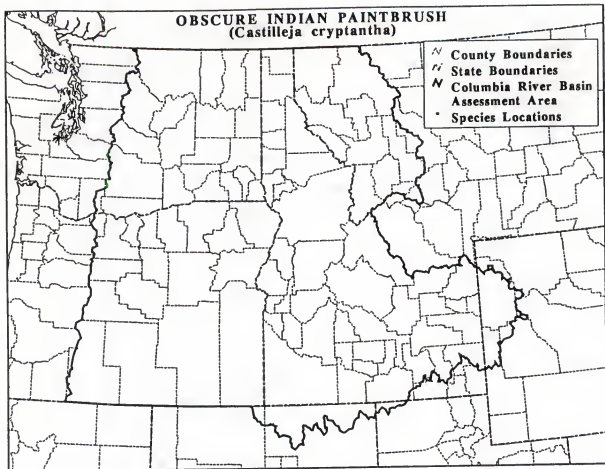


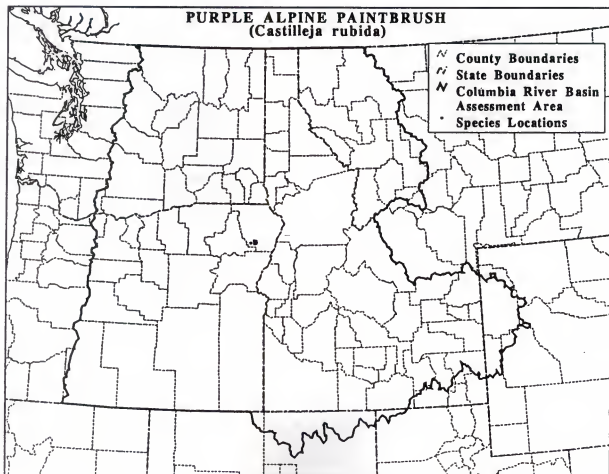
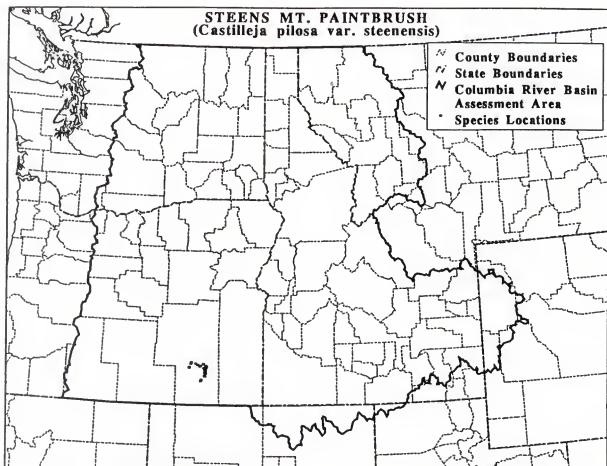


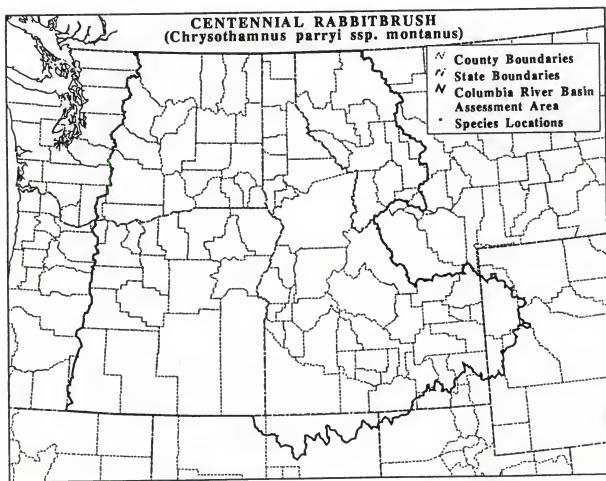
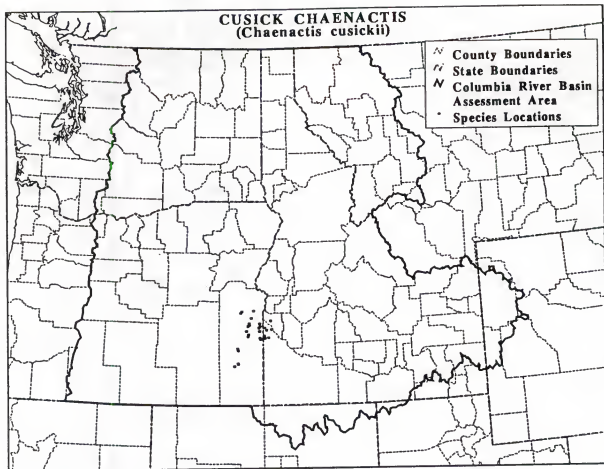


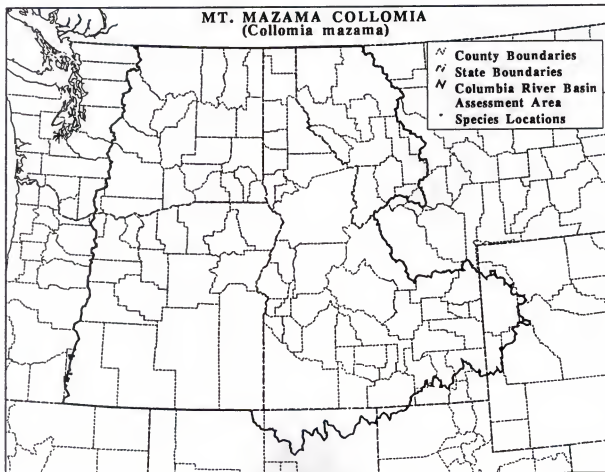
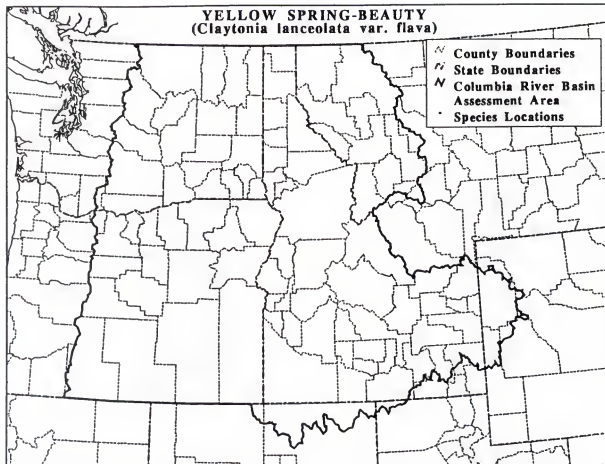


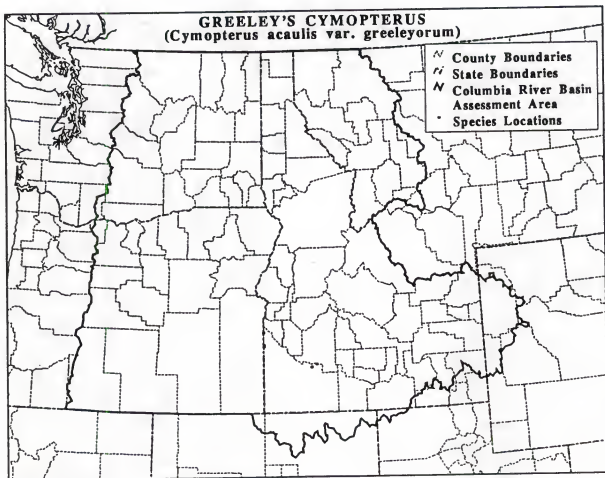
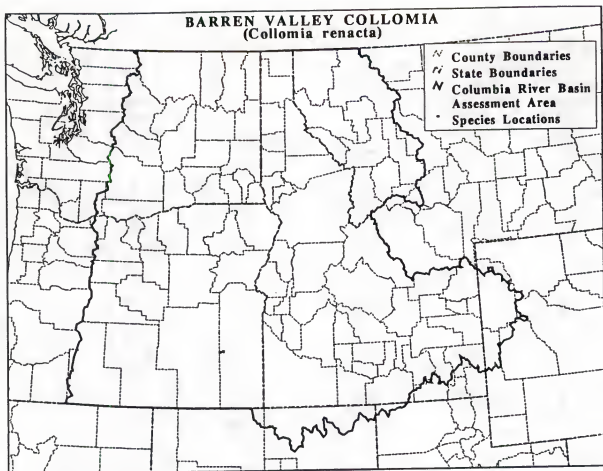


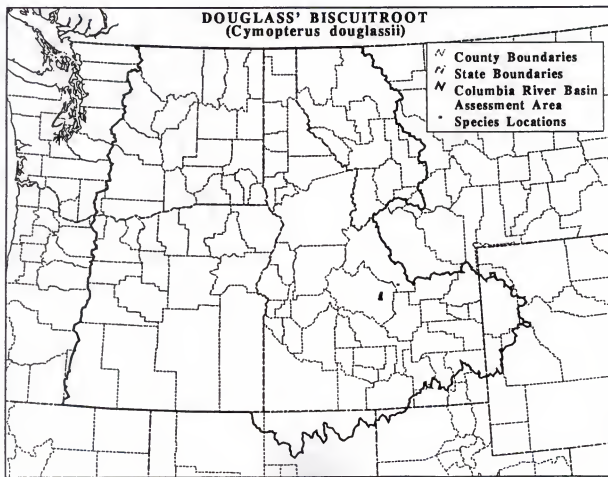
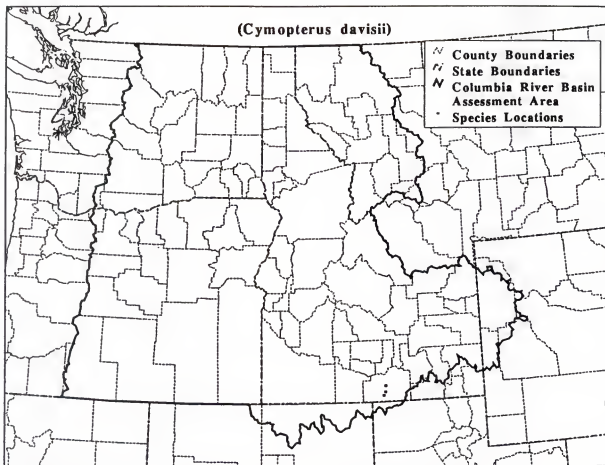


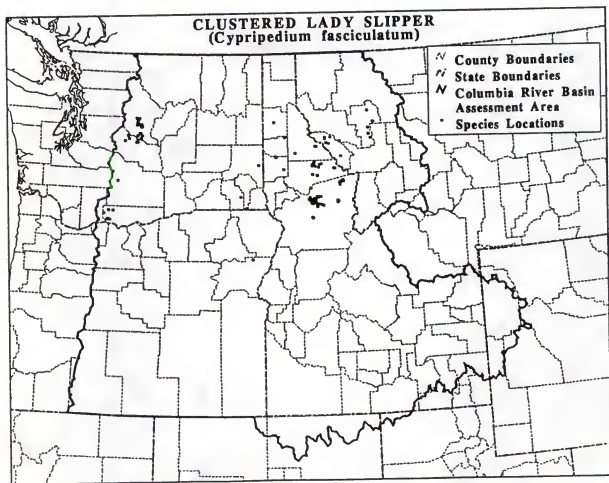
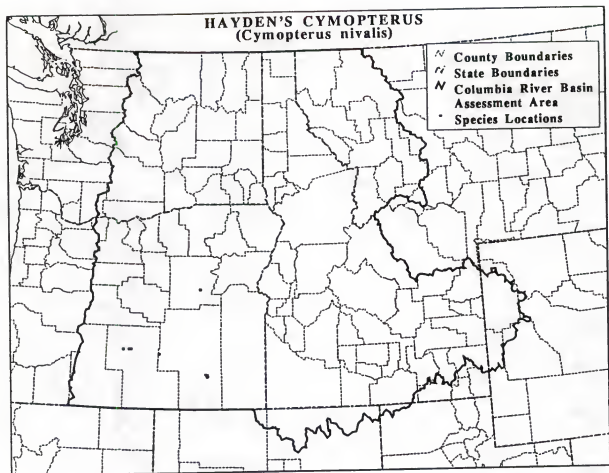


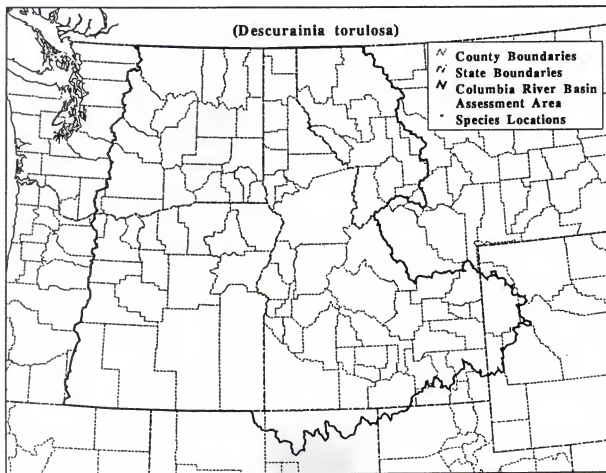
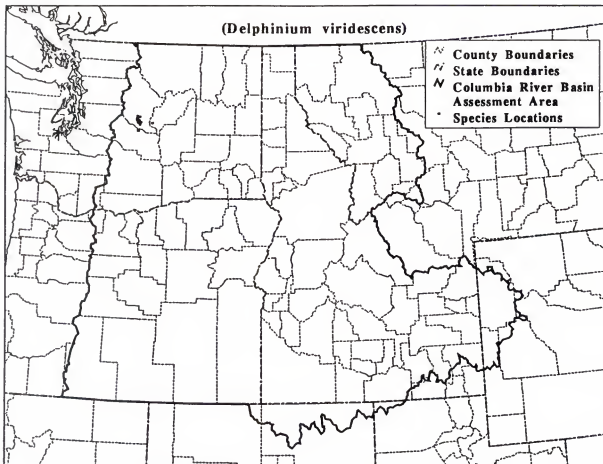


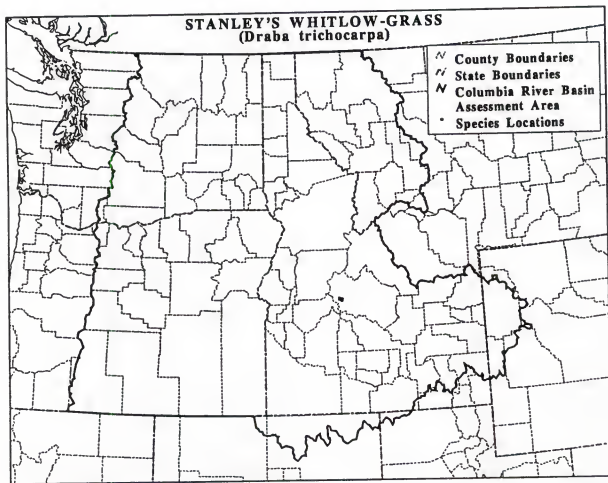
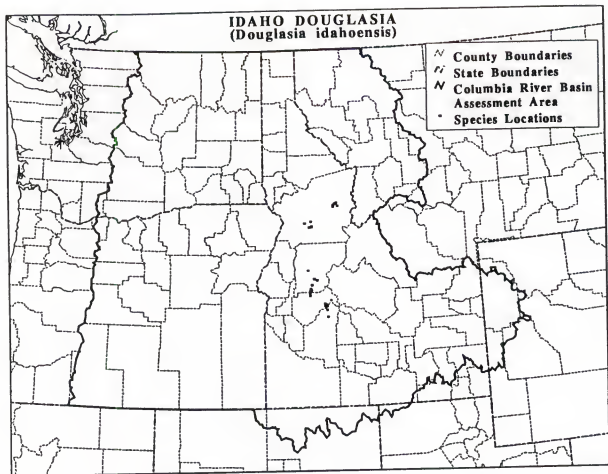


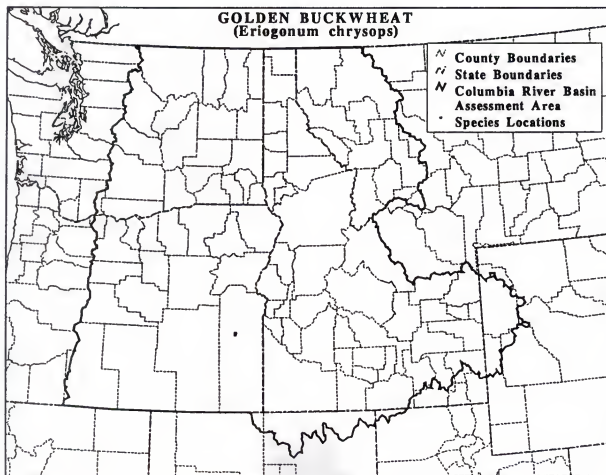
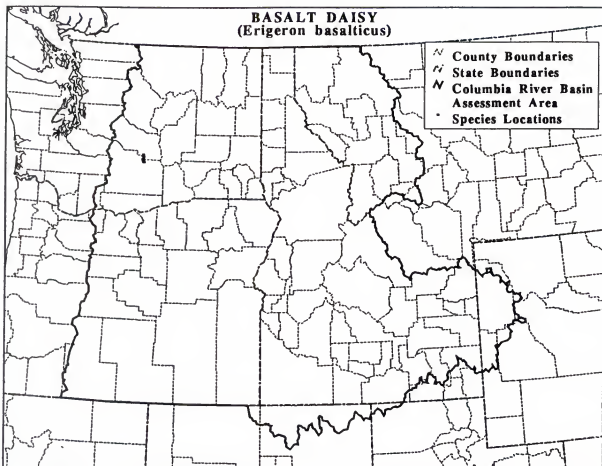


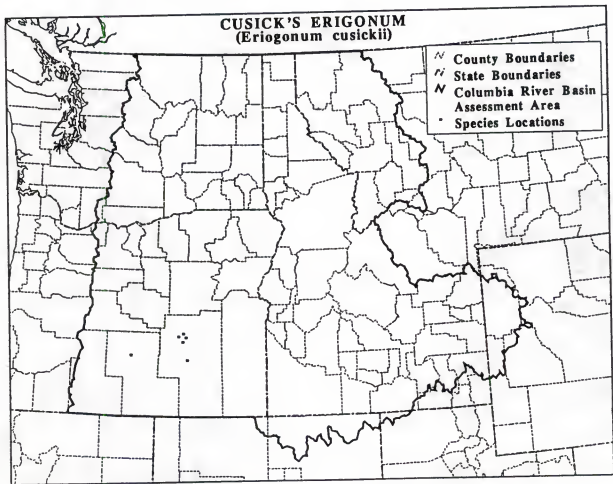
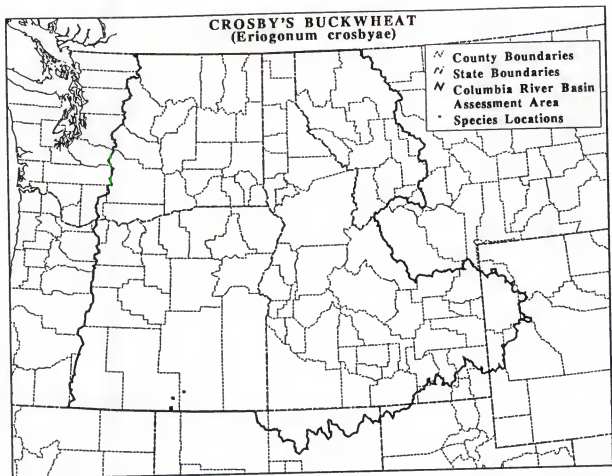


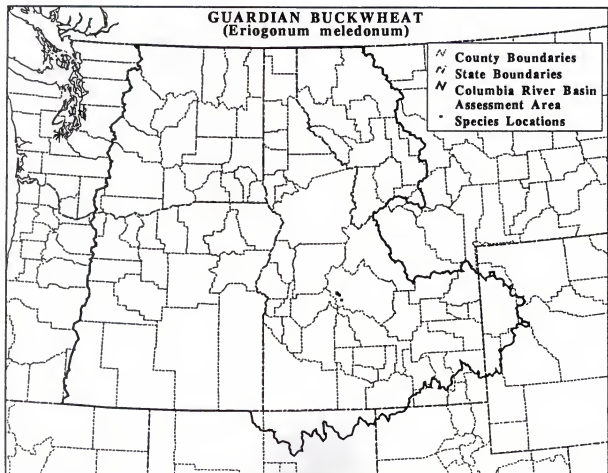
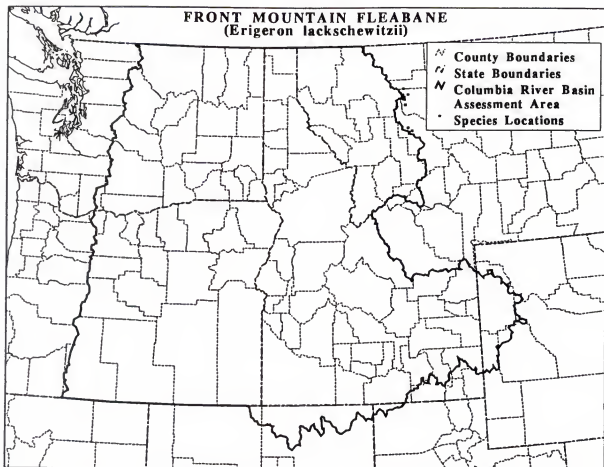


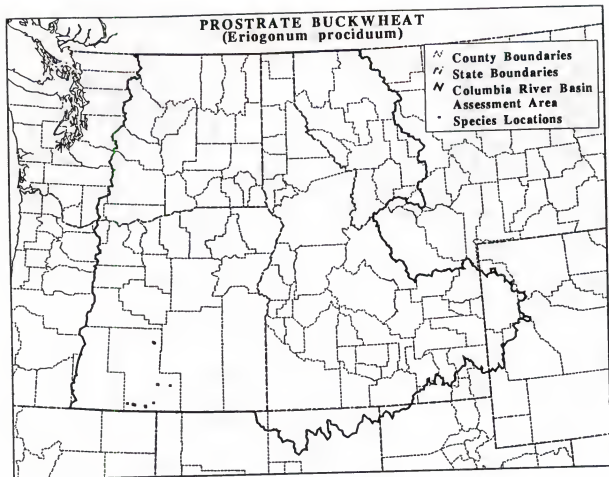


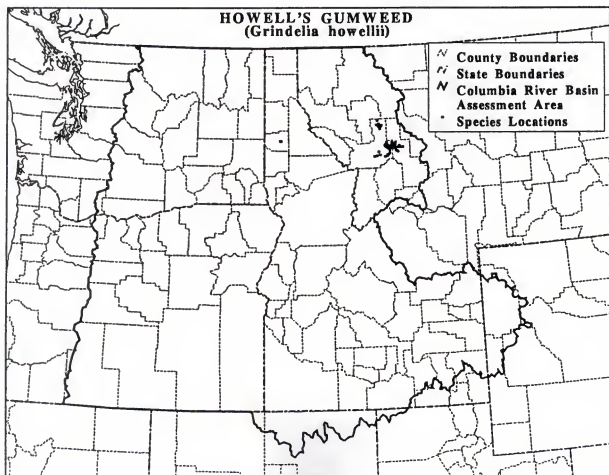
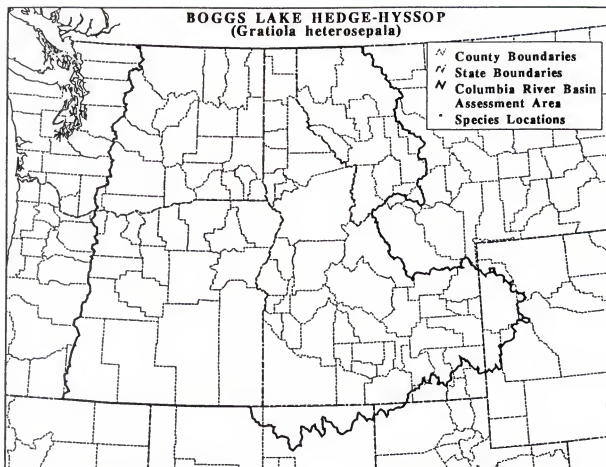


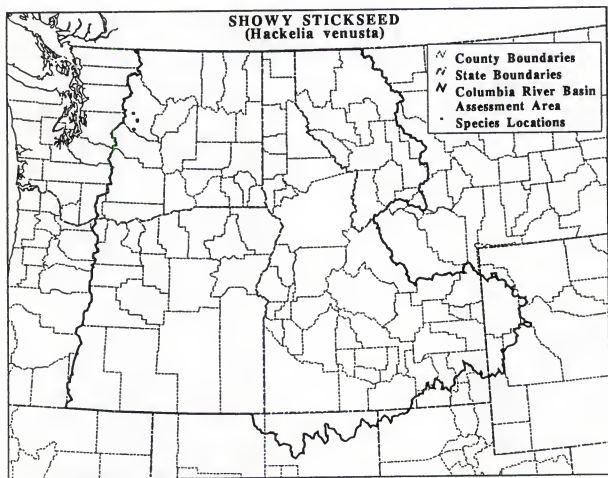
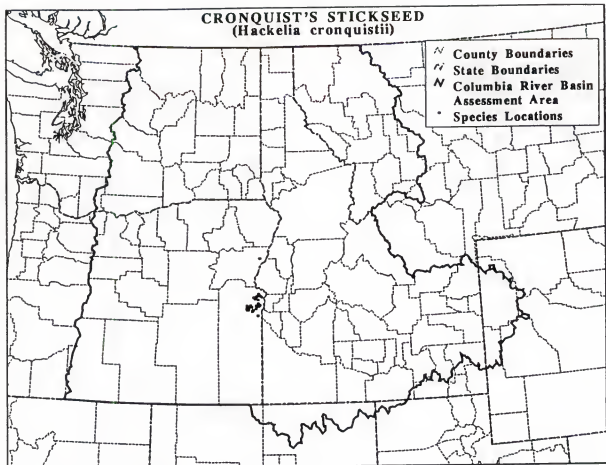


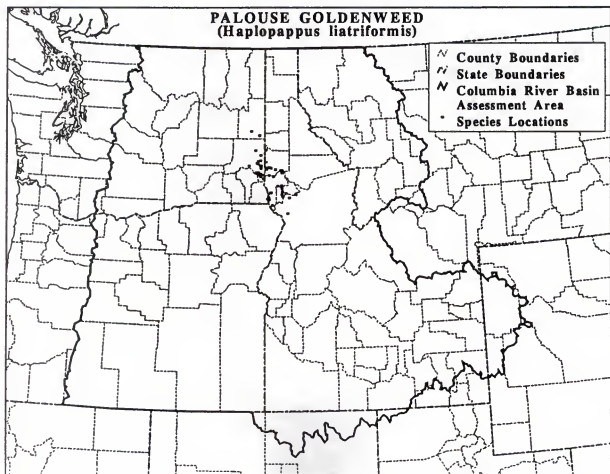
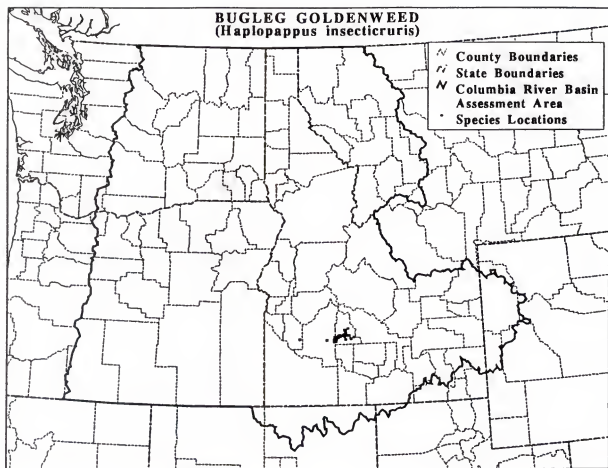


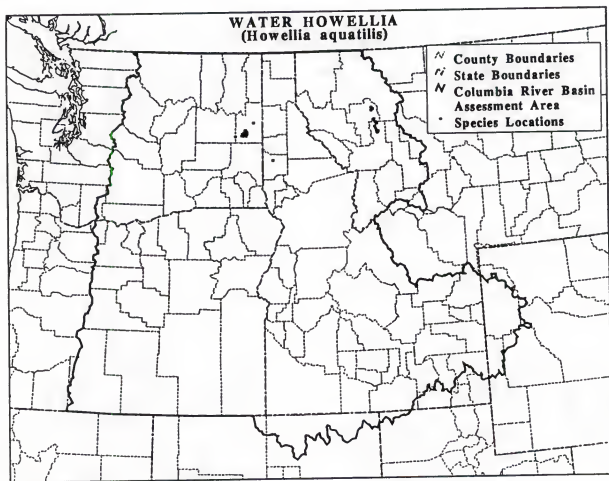
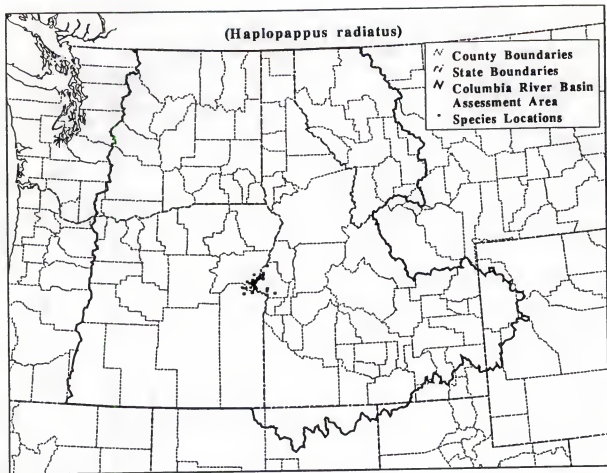


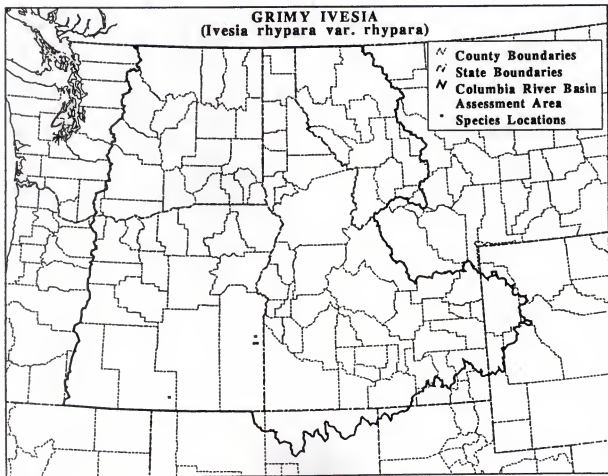
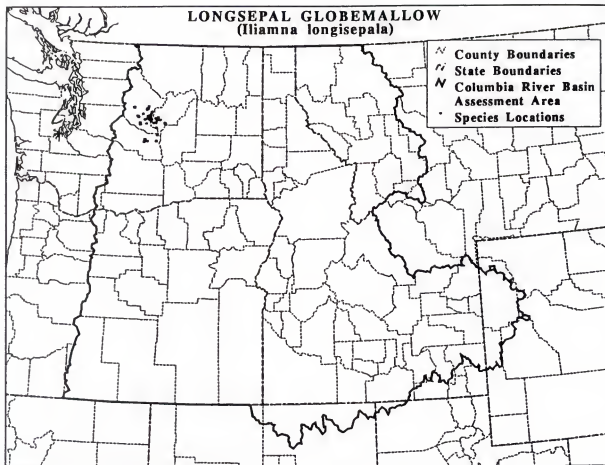


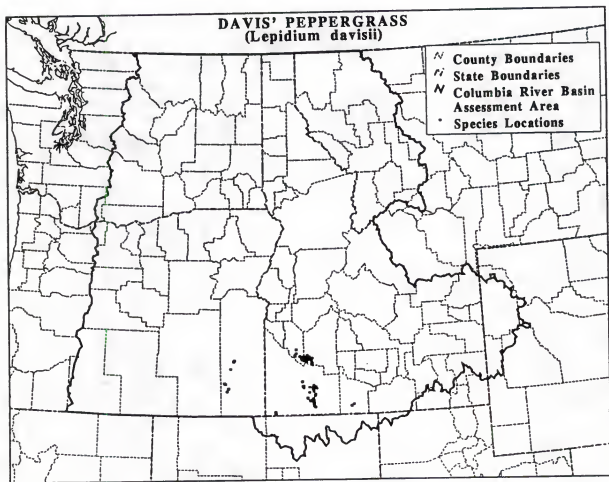
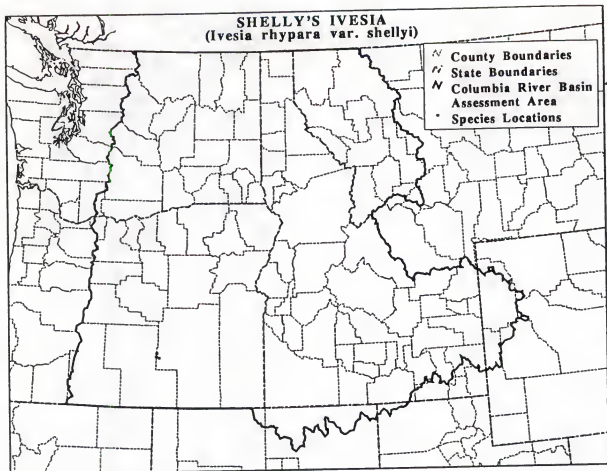


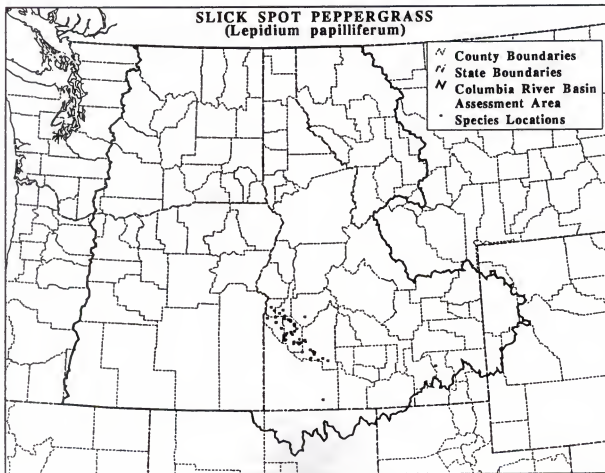
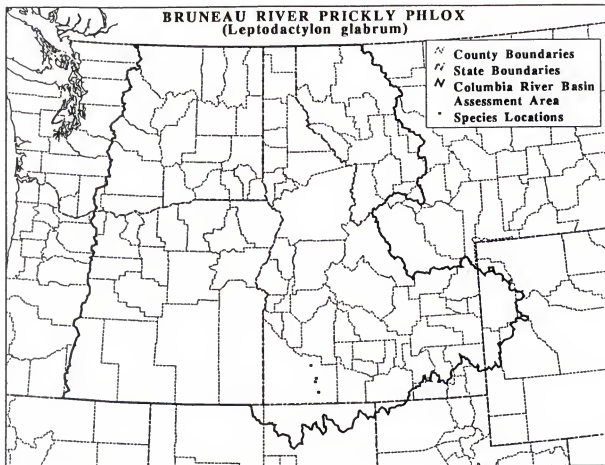


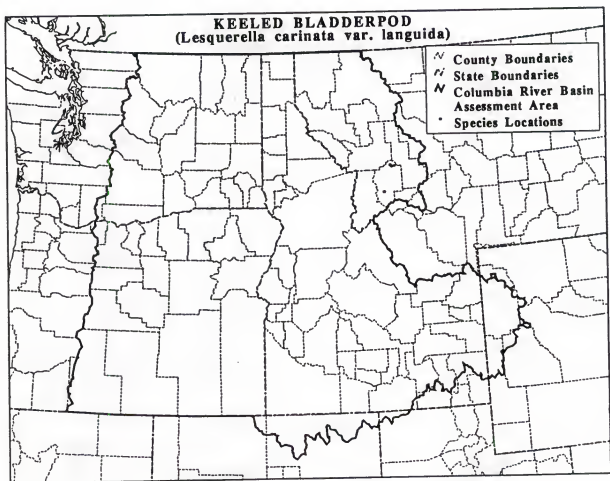
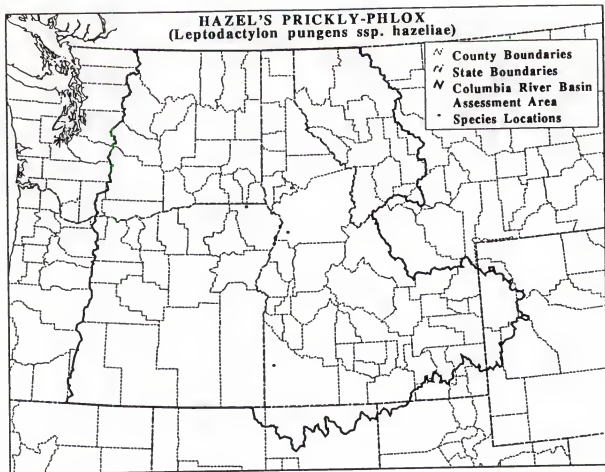


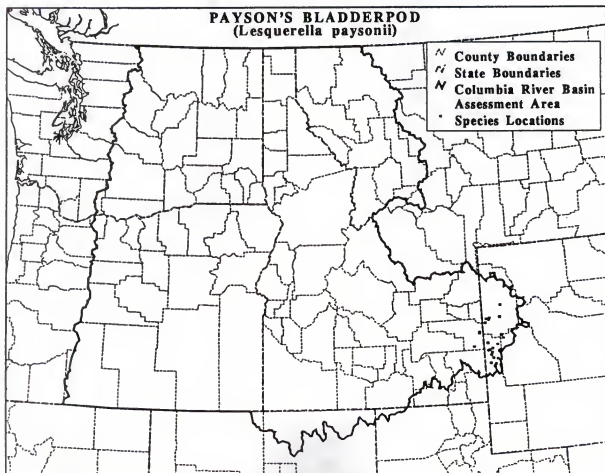
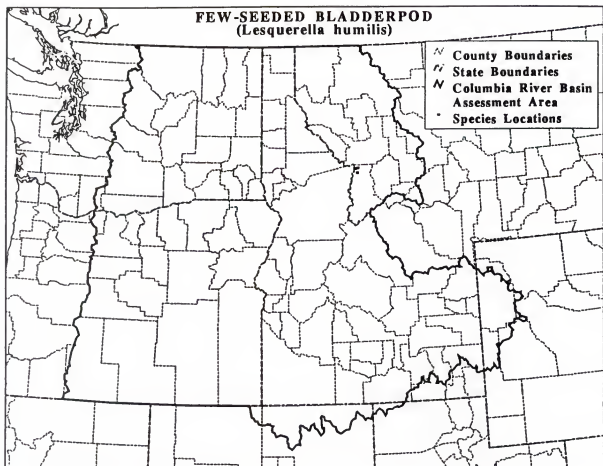


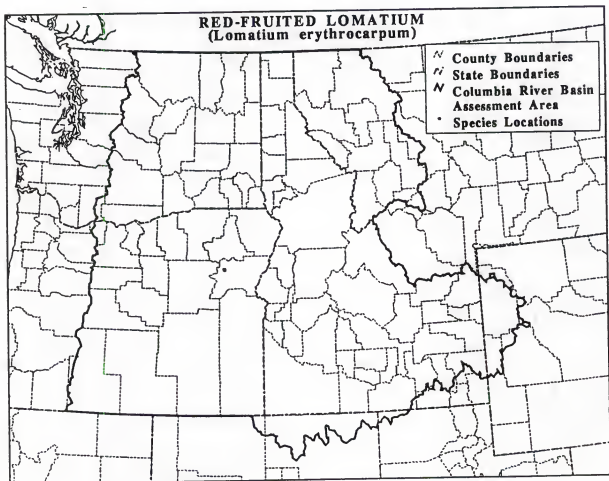
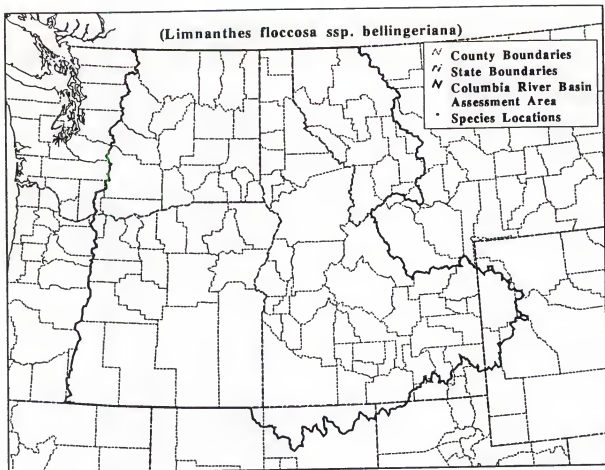


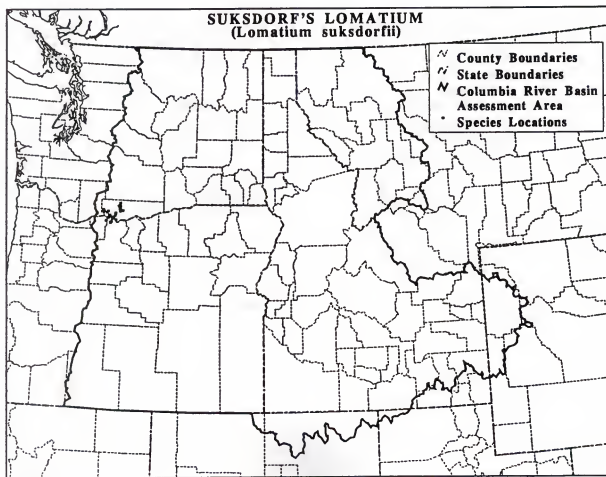
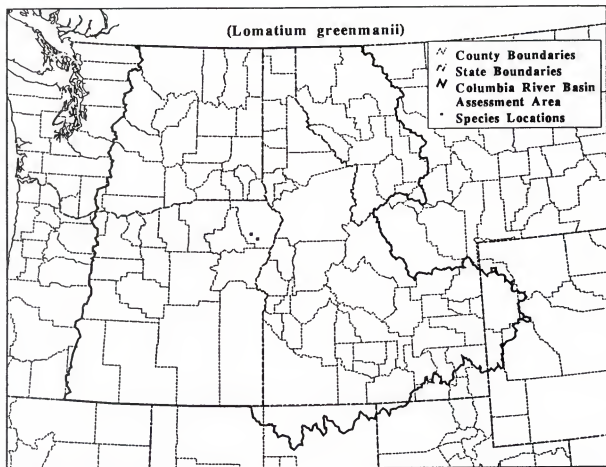


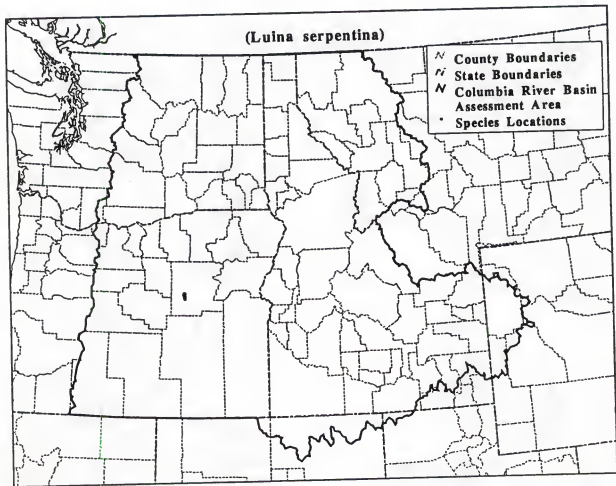
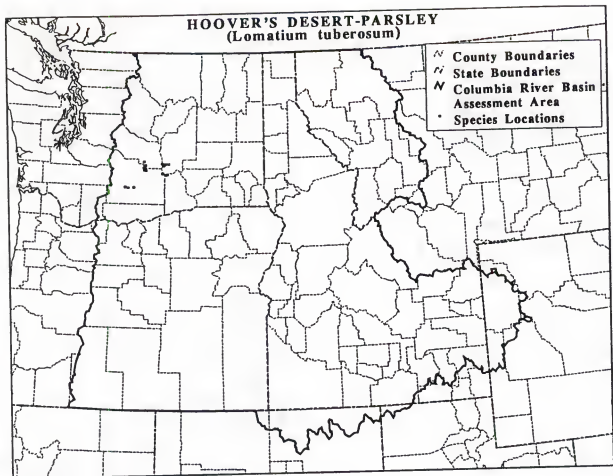


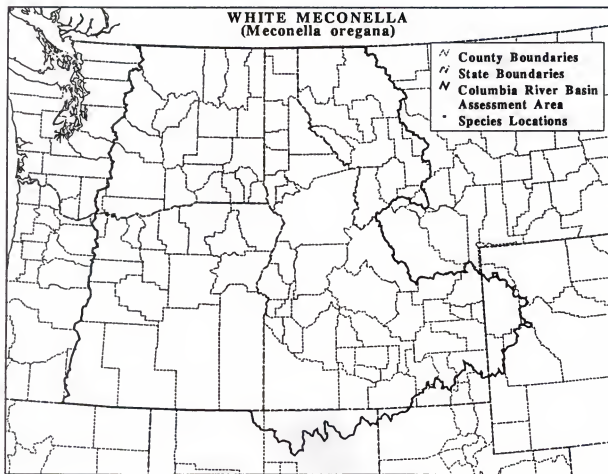
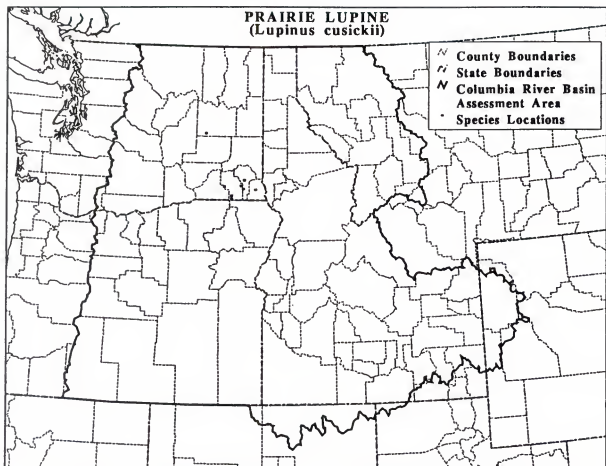


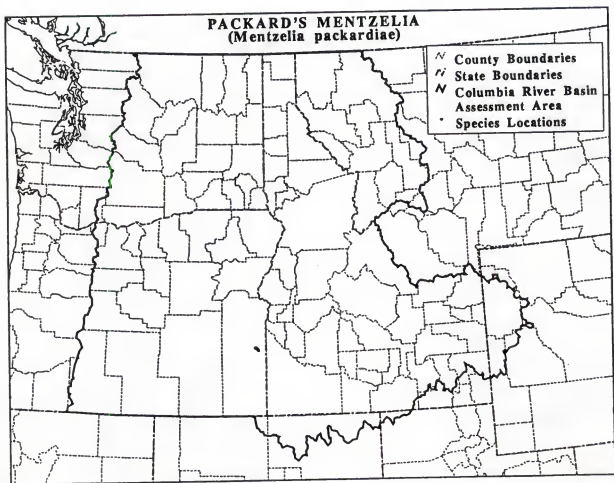
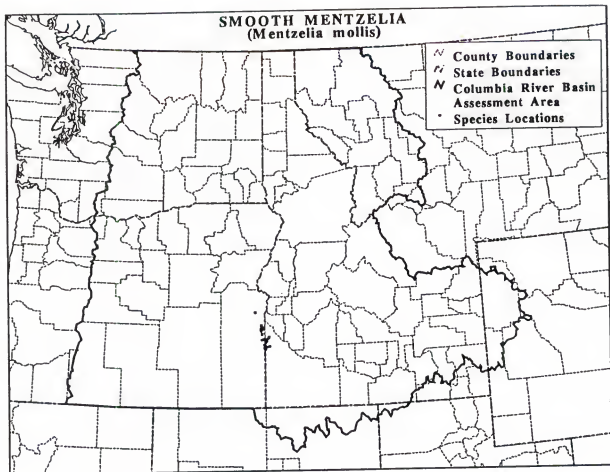


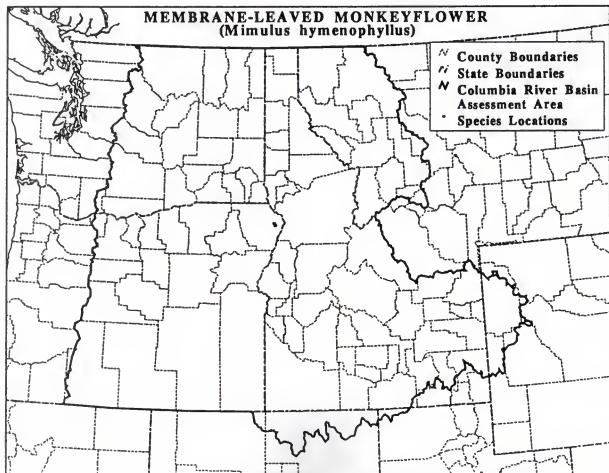
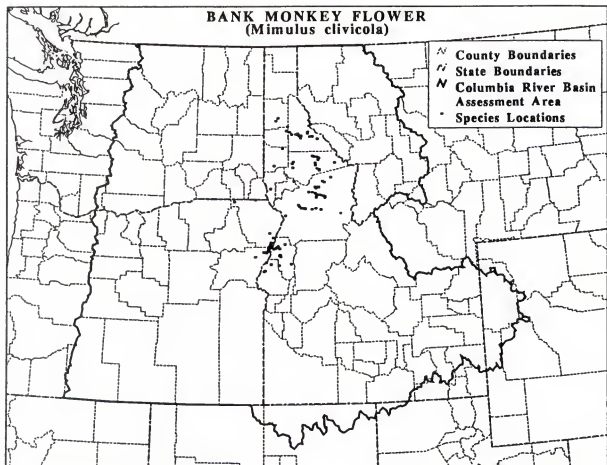


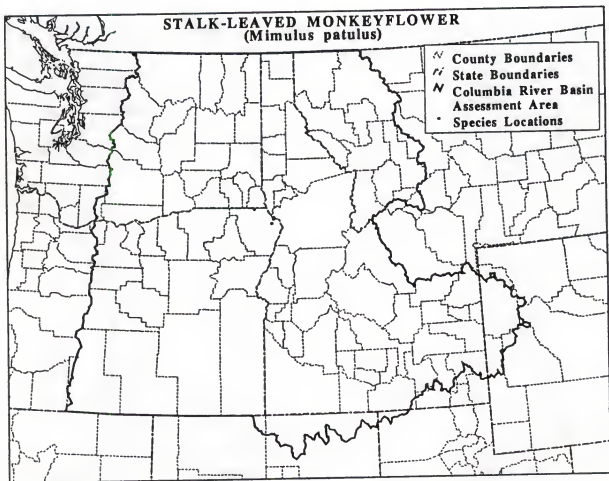
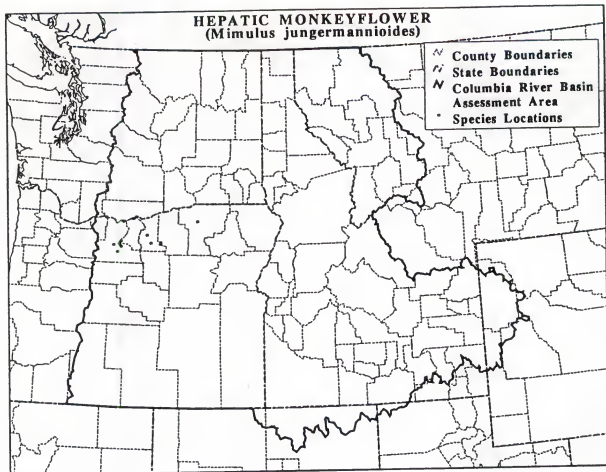


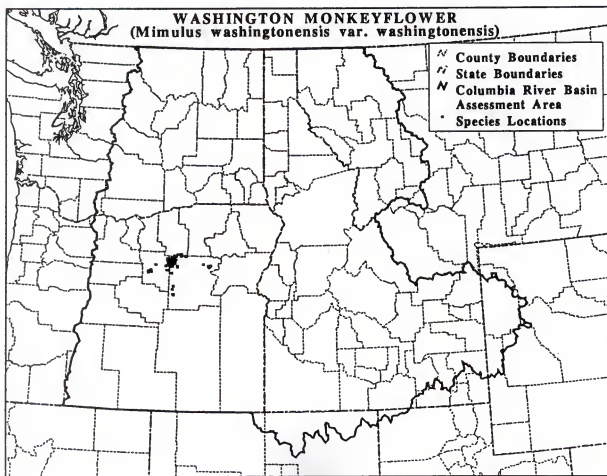
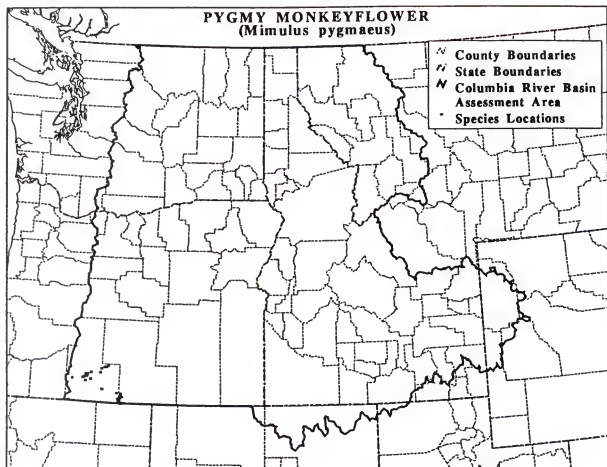


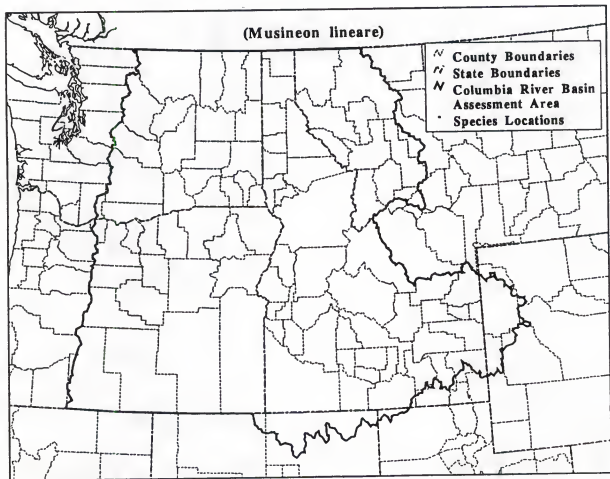
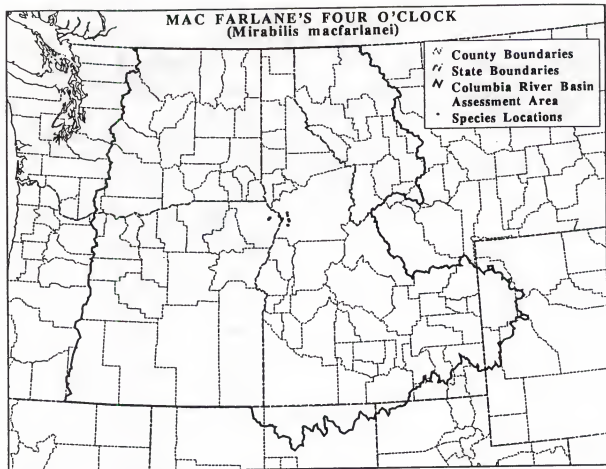


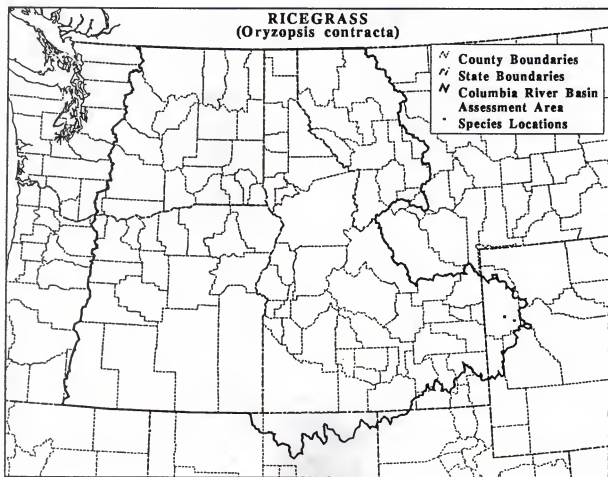
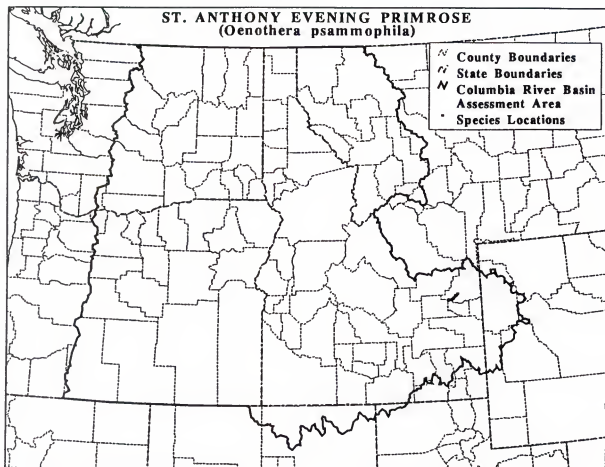


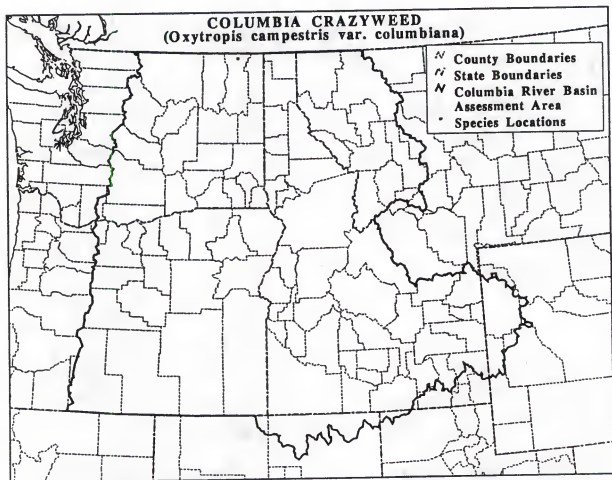
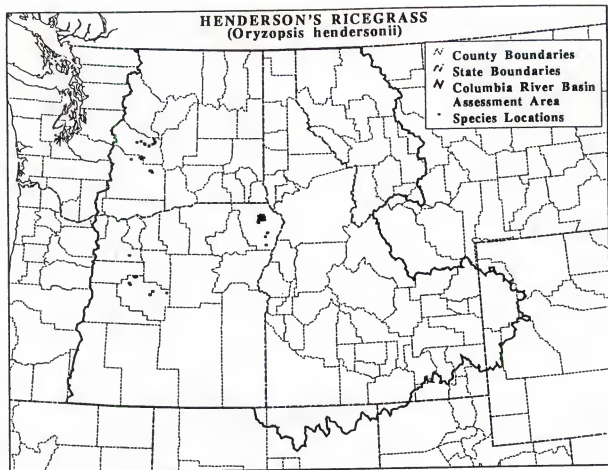


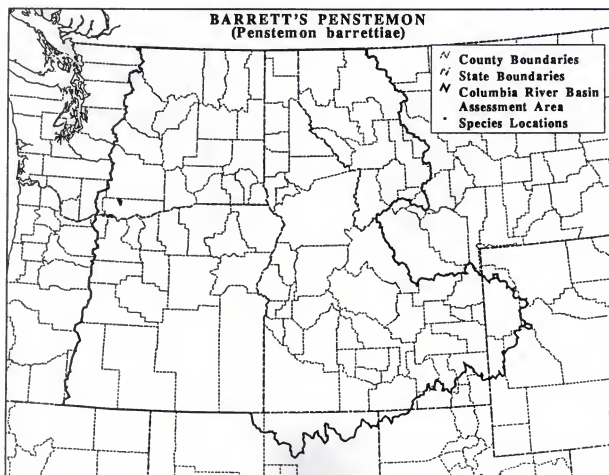
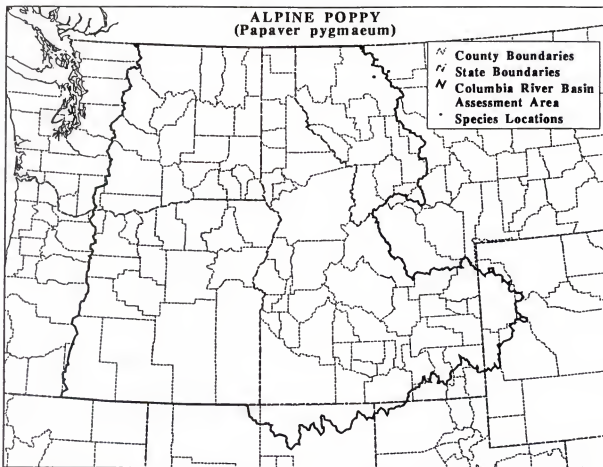


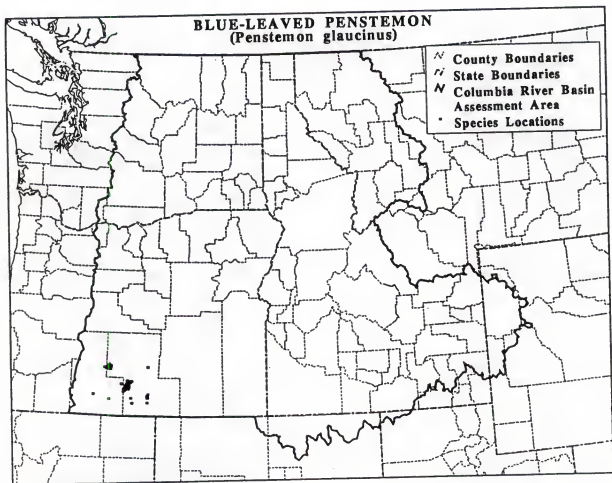
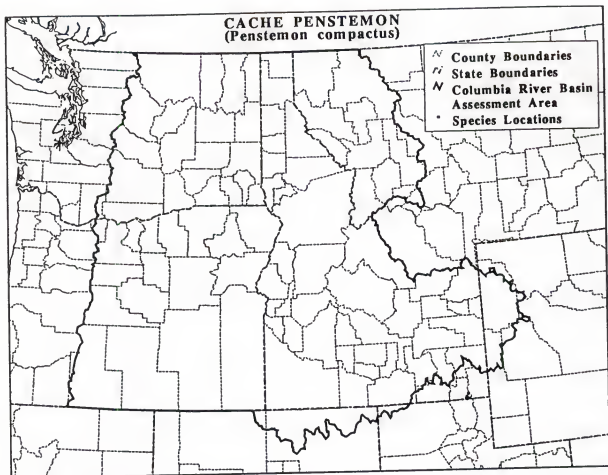


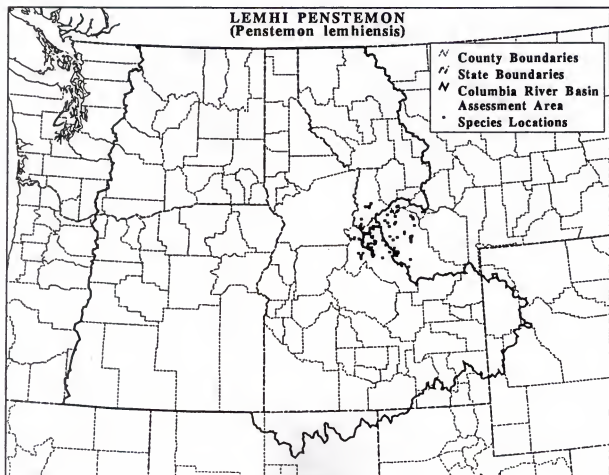
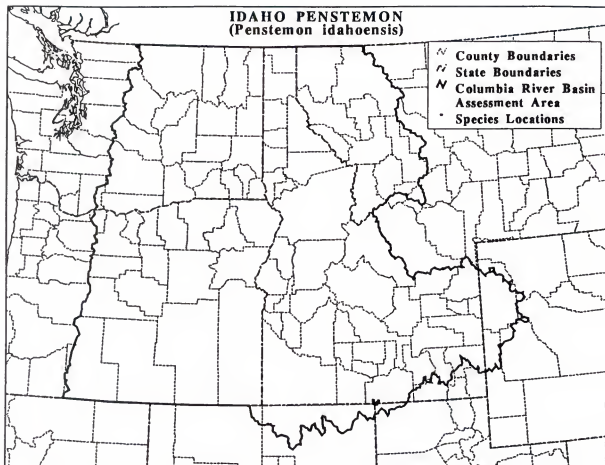


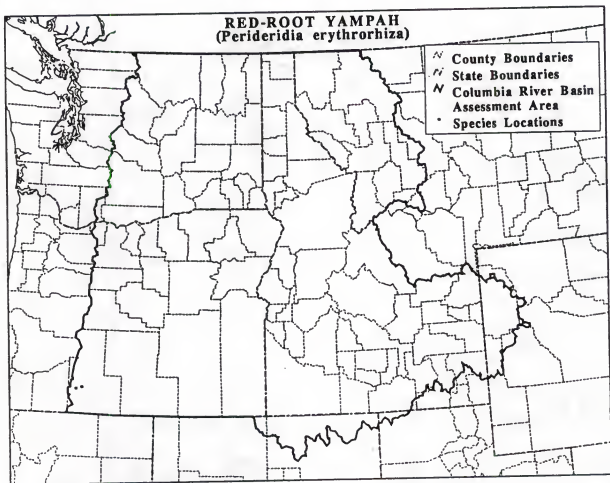
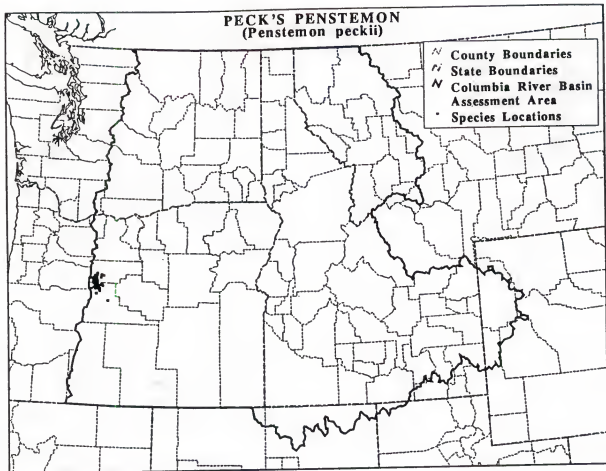


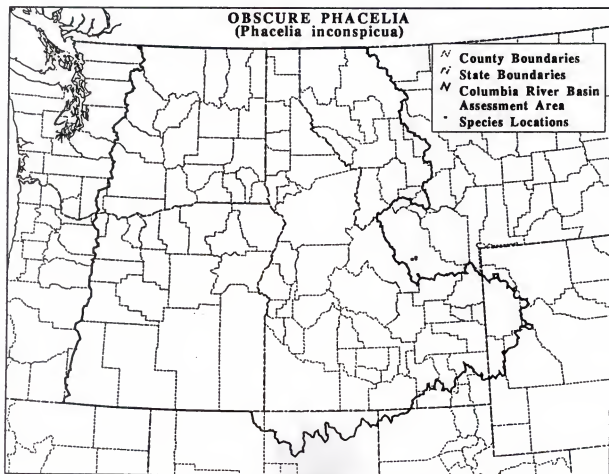
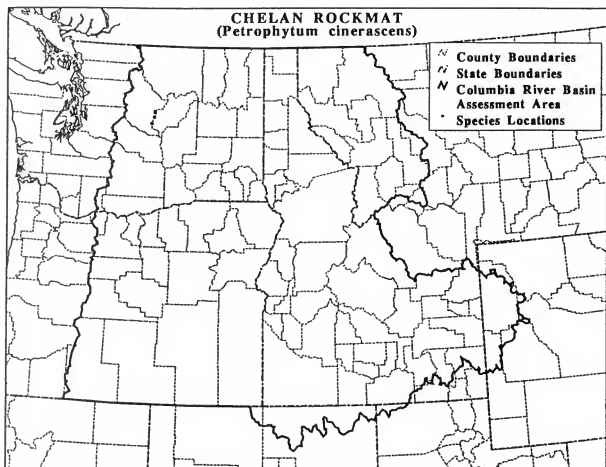


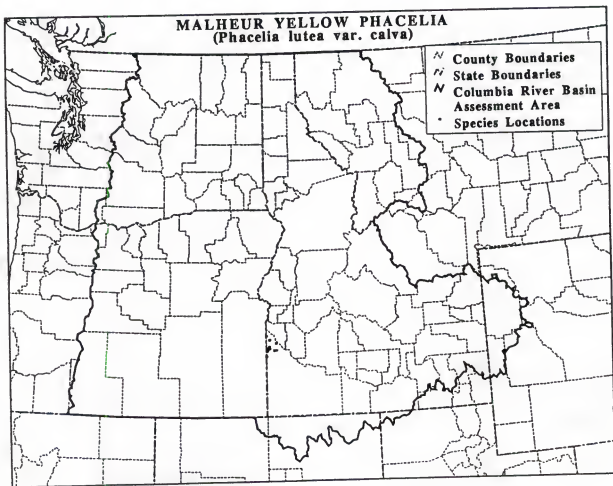
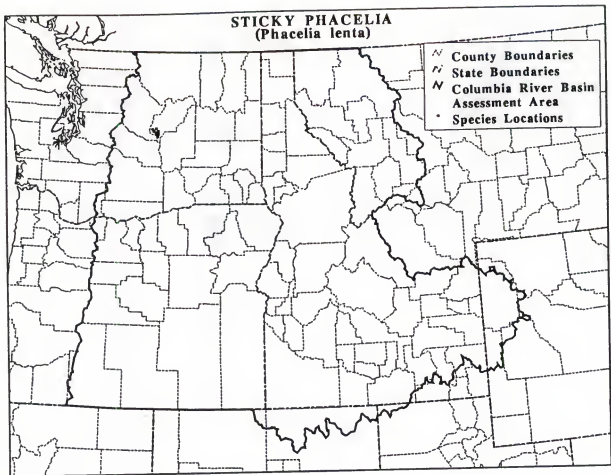


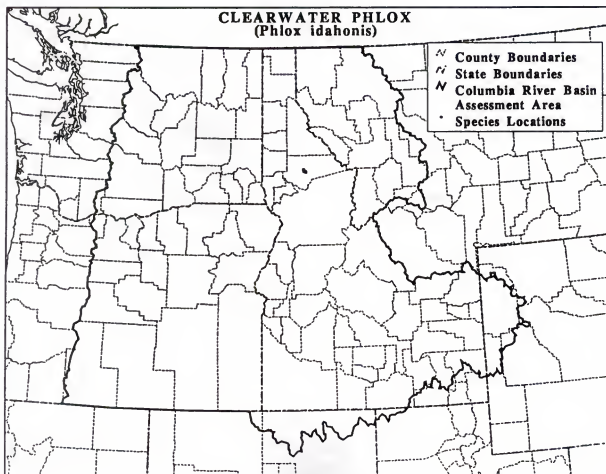
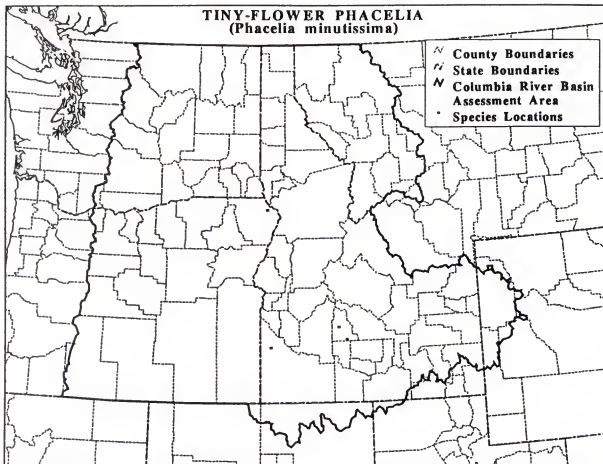


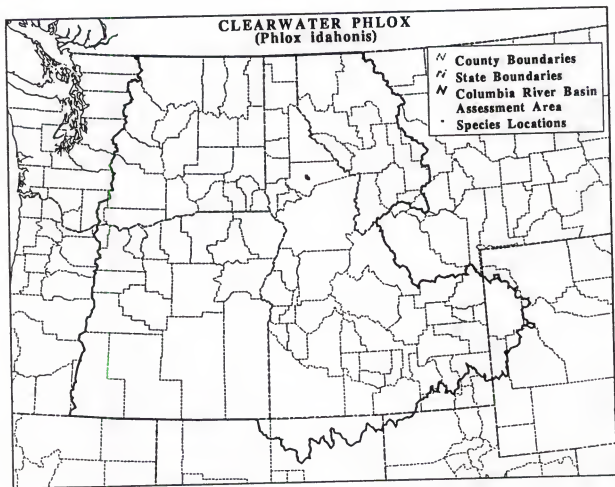
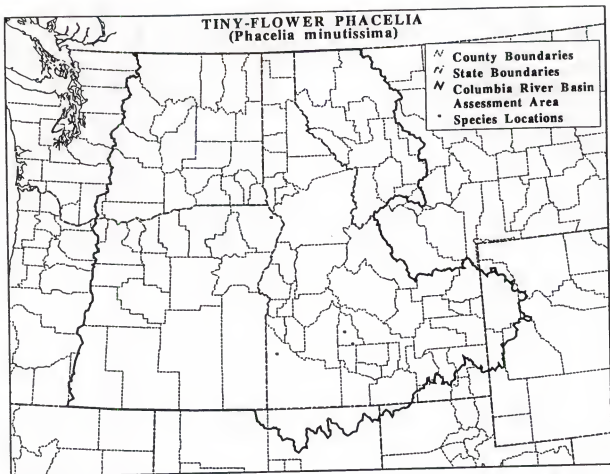


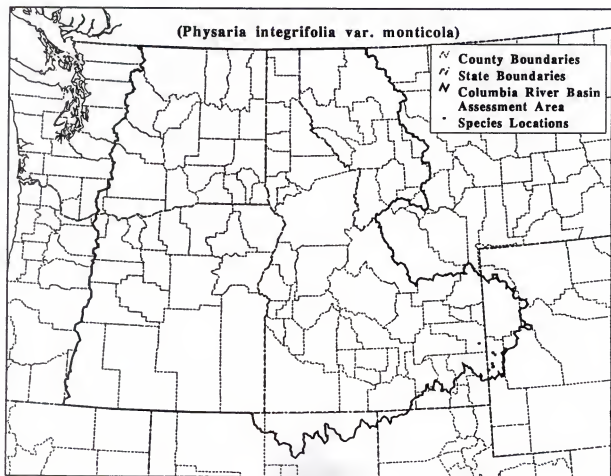
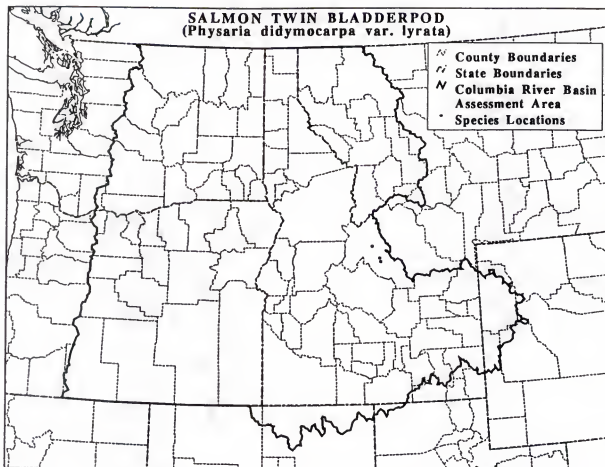


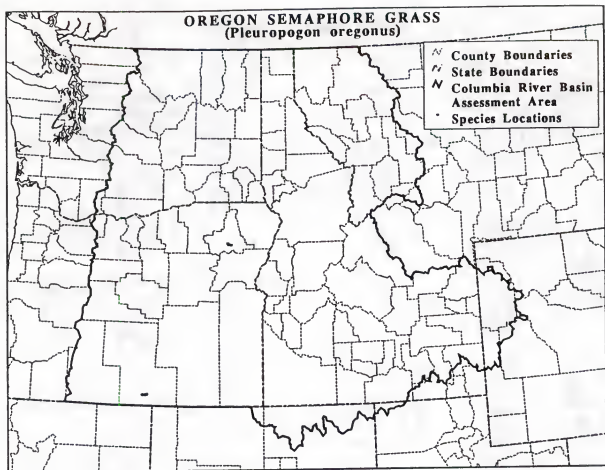


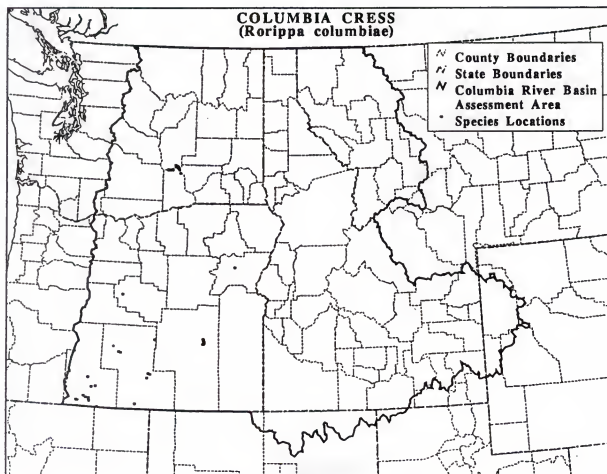
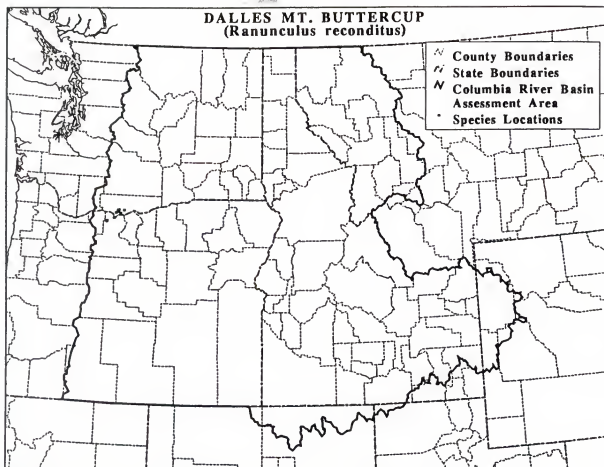


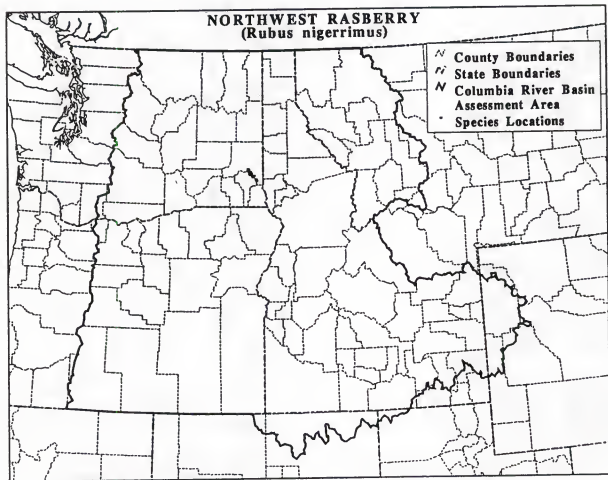
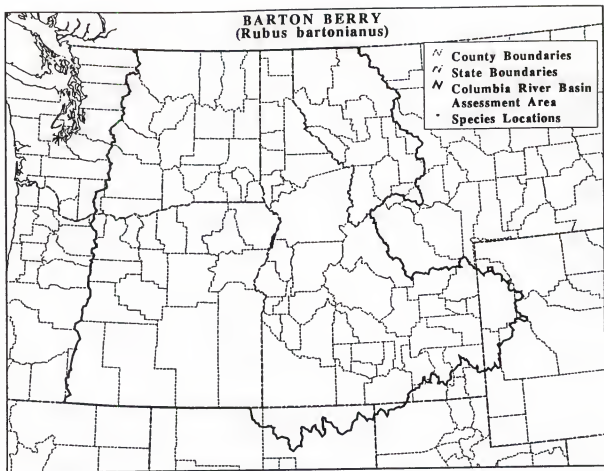


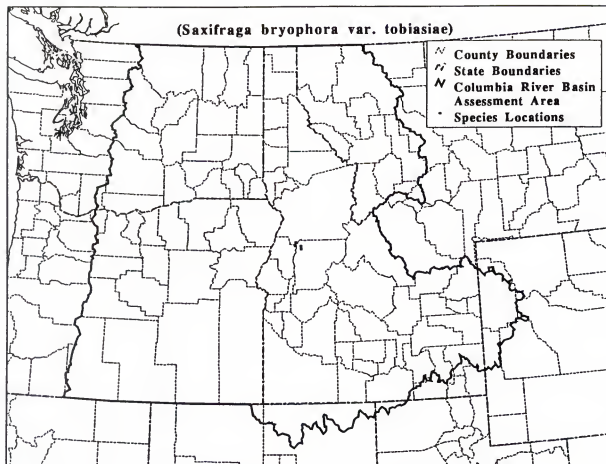


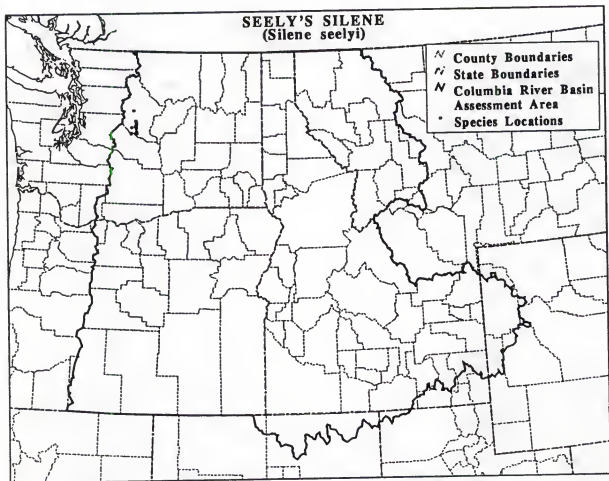
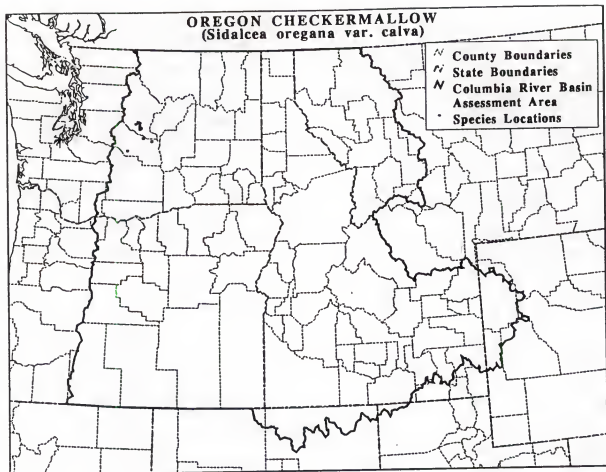


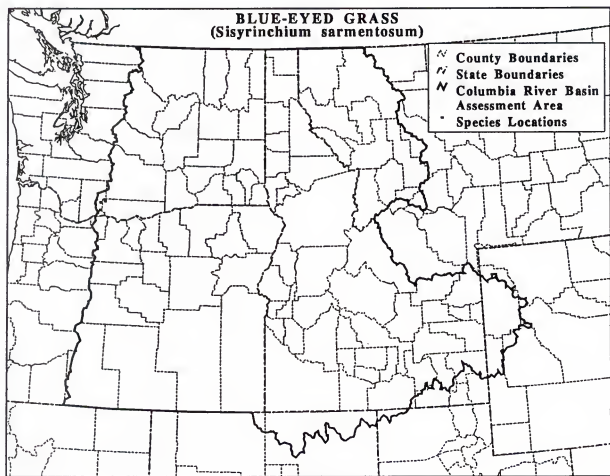
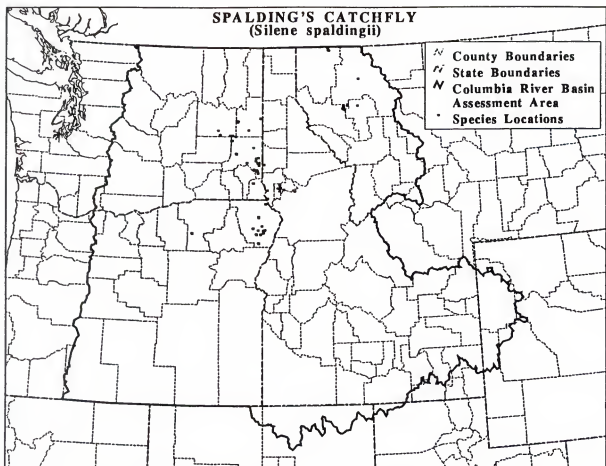


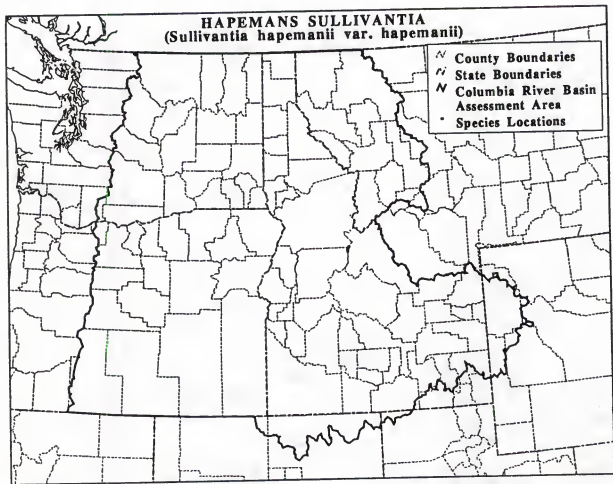
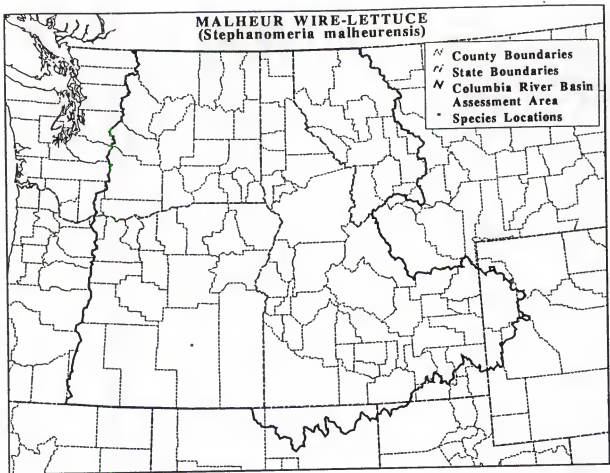


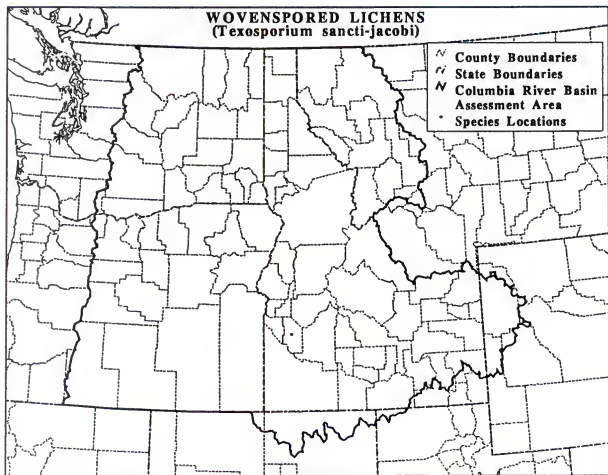
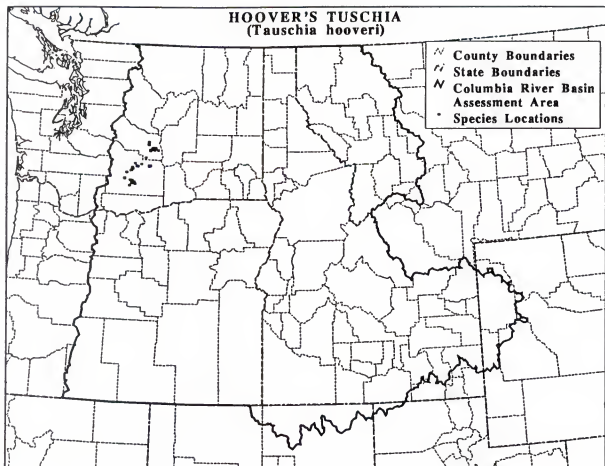


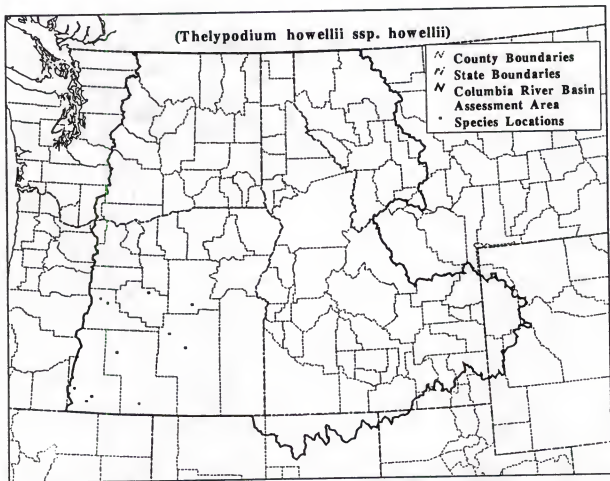
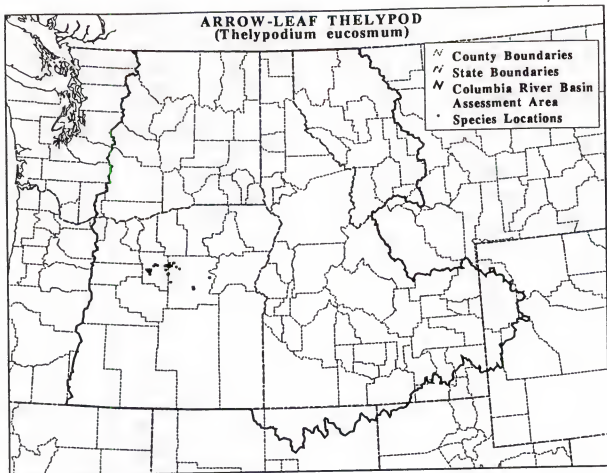


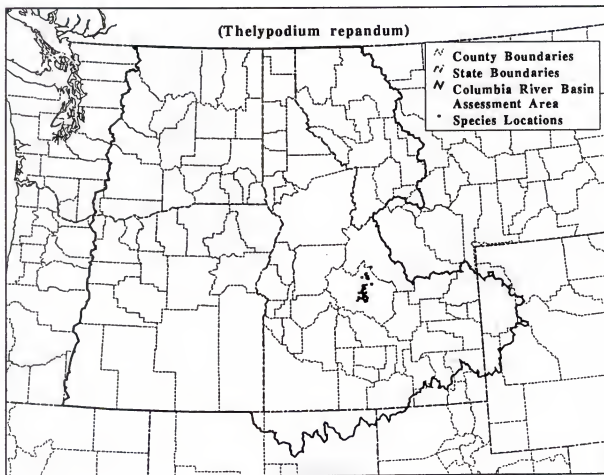
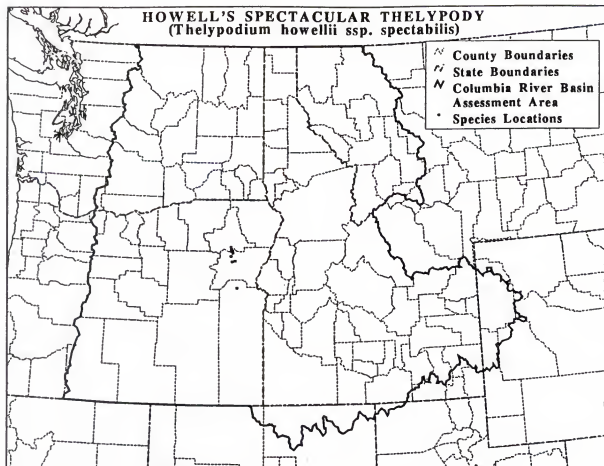


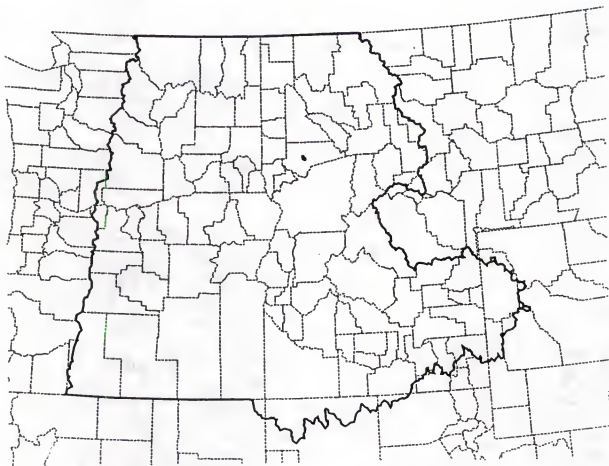
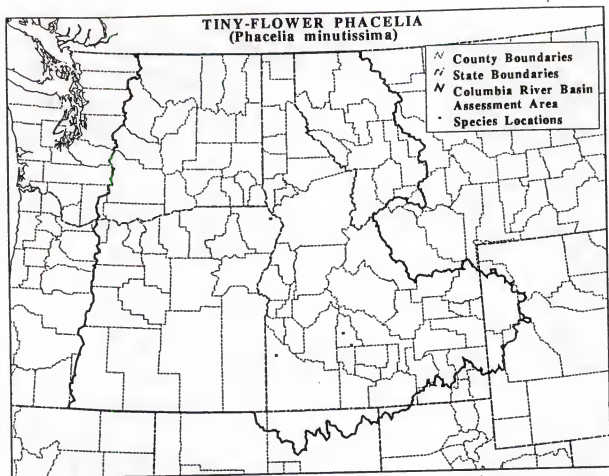


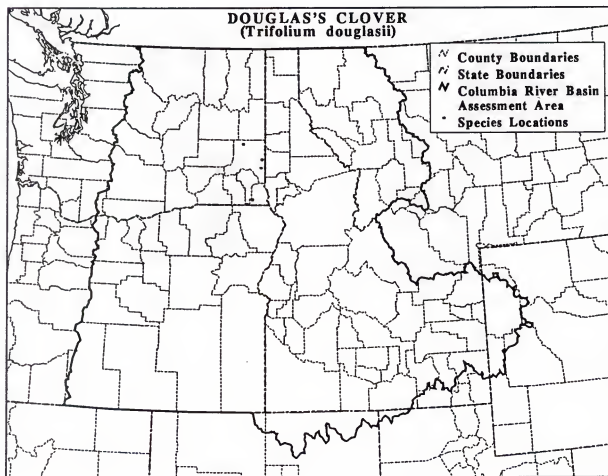
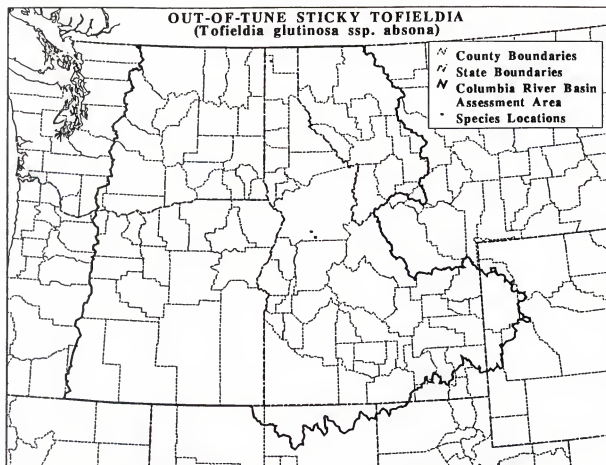


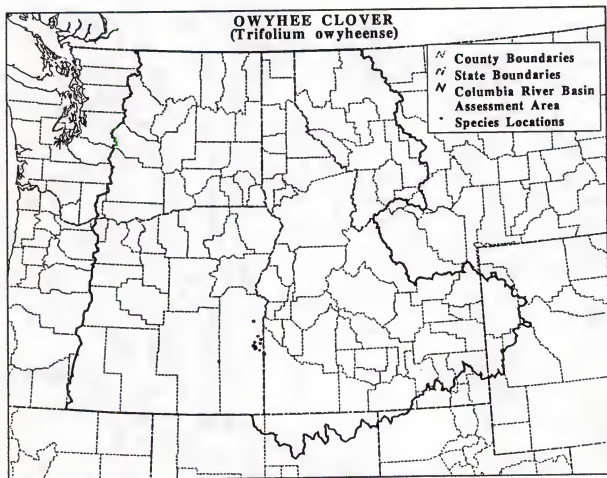
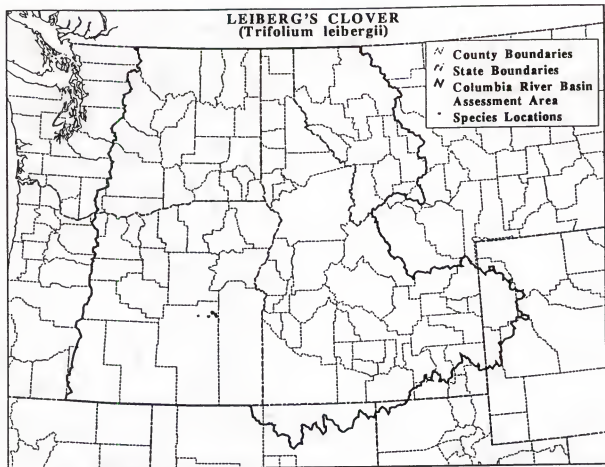


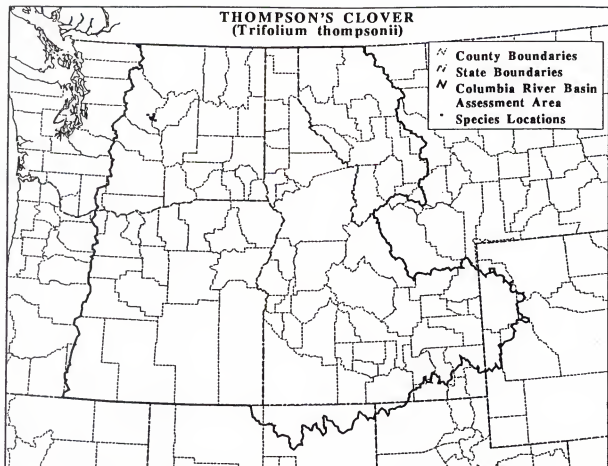












## APPENDIX 2

### List of Species Conservation Reports

Conservation strategies  
Conservation agreements

Taxon	Title	Author	Area	Status/Approval
<i>Amorpha canescens</i>	Conservation agreement	Vale BLM	VAL	Signed, 1992
<i>Asragalus mufordiae</i>	Conservation agreement	Vale BLM	VAL	Signed, 1992
<i>Asragalus sinuatus</i>	Conservation agreement	Camp, P.	Wash.	Draft
<i>Eriogonum cuscutifolium</i>	Conservation agreement	Taylor, Housely	LKV, BRN	In preparation
<i>Howellia aquatilis</i>	Conservation agreement	Benner, B.	Wash.	Draft
<i>Ivesia hyemalis</i> , <i>Eriogonum crassifolium</i>	Conservation agreement	Housely	LKV	In preparation
<i>Lepidium davisi</i>	Conservation agreement	Vale, Burns BLM	VAL, BRN	Final, waiting for signature
<i>Palenionium pectinatum</i>	Conservation agreement	Benner, B.	Wash.	Draft
<i>Rorippa columbiana</i>	Conservation agreement	Kaye, T.	Range-wide - OR, WA	In preparation
<i>Senecio erriense</i> , <i>Mentzelia packardiana</i> , <i>Ivesia hyemalis</i> var. <i>hyemalis</i>	Conservation agreement	Vale BLM	VAL	Signed, 1992
<i>Silene spaldingii</i>	Conservation agreement	Benner, B.	Wash.	Draft
<i>Stephanomeria malheurensis</i>	Conservation agreement	Carlson, J.	BRN	Signed, 1990
<i>Alliopsis virgata</i>	Conservation strategy	Lichthardt, J.	BVR, BIT, DRL, LOL, NEZ, PAY	Draft
<i>Asarum wagneri</i>	Conservation strategy	Baldwin	WIN	Draft
<i>Blechnum spicant</i>	Conservation strategy	Blake, J., C. Ebrahimi	PAN	Signed, 1992
<i>Baileya gillmanii</i> , <i>B. manitoba</i> , <i>B. pinnatifida</i>	Conservation strategy	Zika, P.	MTH	Draft
<i>Baileya pinnatifida</i>	Conservation strategy	O'Neill, Hopkins	DES	Draft
<i>Baileya pinnatifida</i>	Conservation strategy	Nylander, S.	BC	Draft, ONHP, 1987
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	Conservation strategy	Kaye, T., rvd, R. Wooley	FRE	Signed 1995
<i>Calochortus nitidus</i>	Conservation strategy	Caico, S.L.	NEZ	Implemented / Not signed, 1992
<i>Castilleja chlorotica</i>	Conservation strategy	Kaye, T., W. Messinger	ODA & FRE	Draft, 1991
<i>Castilleja chlorotica</i>	Conservation strategy	Wooley, R. S. Phillips	FRE	Signed 1994
<i>Castilleja fraterna</i>	Conservation strategy	Kagan, J.	OBM, CGF - USFS & ONHP	Draft, 1987
<i>Castilleja rubra</i>	Conservation strategy	Kagan, J.	OBM, CGF - USFS & ONHP	Draft, 1987
<i>Callispermum montanum</i>	Conservation strategy	Jones, C.	WIN	In preparation
<i>Carruthersia nuttallii</i>	Conservation strategy	Loraine, C.C.	CLW, NEZ	Implemented / Not signed
<i>Cypripedium fasciculatum</i>	Conservation strategy	Harrod, R., D. Knecht	WEN	In preparation
<i>Cypripedium fasciculatum</i>	Conservation strategy	Kagan, J.	KLA	Draft, 1990
<i>Delphinium viridescens</i>	Conservation strategy	Lillybridge, T.	WEN	Signed, 1989
<i>Dryopteris filix-mas</i>	Conservation strategy	Zika, P.	UMA	Draft
<i>Grindelia howellii</i>	Conservation strategy	Loraine, C.C.	PAN	Implemented / Not signed
<i>Grindelia howellii</i>	Conservation strategy	Loraine, C.C.	St. Joe N.F., ID	Draft, IDNSHP, IDFG & G, 1991
<i>Grindelia venusta</i>	Conservation strategy	Lillybridge, T.	WEN	In preparation
<i>Haplopappus radialis</i>	Conservation strategy	Taylor-Grant, Deholl, Hanson	PAY	In preparation
<i>Huellia aquatilis</i>	Conservation strategy	Shelly, J.S.	FLT	Signed, 1994
<i>Listeria borealis</i>	Conservation strategy	Ahlenslager, K.	COL	Draft
<i>Lomatium greenmanii</i>	Conservation strategy	Kagan, J.	CCS, TNC & USFS, WAW	Draft, 1987
<i>Lupinus serpentina</i>	Conservation strategy	Vander Schaaf, D.	CGF, TNC & USFS, MAL	Draft, 1987
<i>Lupinus serpentina</i>	Conservation strategy	Yates, G.	MAL	Draft
<i>Mimulus alpestris</i>	Conservation strategy	Loraine, C.C.	CLW, NEZ	Implemented / Not signed
<i>Mimulus alpestris</i>	Conservation strategy	Loraine, C.C.	Range-wide R1 - CLW, PAN, NEZ / R4, R6	Implemented / Not signed
<i>Mimulus alpestris</i>	Conservation strategy	Meinke, R.	WIN, FRE	Signed 1994
<i>Mimulus washingtonensis</i>	Conservation strategy	Meinke, R.	UMA	Draft
<i>Pentstemon glaucinus</i>	Conservation strategy	Wooley, R.	FRE	Signed 1993
<i>Pentstemon lewisii</i>	Conservation strategy	Elizabeth, C.	Range-wide R1-BVR, BIT, DRL / R4 - SAL / BLM - ID, MT	In preparation
<i>Pentstemon peckii</i>	Conservation strategy	O'Neill	DES	Implemented / Signed 1992
<i>Psoralea cuneata</i>	Conservation strategy	Lillybridge, T.	WEN	Draft
<i>Psoralea cuneata</i>	Conservation strategy	Boek, K.	OAK	Draft
<i>Rorippa columbiana</i>	Conservation strategy	Kaye, T.	WIN, SPO, BRN, LKV	In preparation

Conservation strategies  
Conservation agreements

<i>Silene spaldingii</i>	Conservation strategy	Kegan, J.	WAW	Draft, 1989
<i>Thelypoda pikepikoti</i>	Conservation strategy	KOO	KOO	Signed, 1993
<i>Trifolium thompsonii</i>	Conservation strategy	Lillywhitke, T.	WEN	Draft
<i>Calochortus longepedunculatus</i> var. <i>longepedunculatus</i>	Conservation strategy (short-term)	Goldenberg, C. Jean	WIN	Draft
<i>Limnium filices</i> ssp. <i>bellingerianus</i>	Conservation strategy/agreement	Maitland, Steven	KLA	Final draft
<i>Oryzopsis heterostachya</i>	Conservation strategy	Vivian, S.	TTTT	Draft

Status reports

Taxon	Title	Author	Area	On File at...Date
<i>Agoseris lachneoides</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Agoseris lachneoides</i>	Status review	D. Pavik, L.A. Schasberger	Gallatin NF	MTNHP, 1990
<i>Allium dichon</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1986
<i>Allium madidum</i>	Status report	Atwood, D.	ID	IDCDC, 1987
<i>Allium madidum</i>	Status report	Bernatas, S.	WAW	IDCDC, 1988
<i>Allium tolmiei</i> var. <i>persimile</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Allium tolmiei</i> var. <i>persimile</i>	Status report	Bernatas, S.	Rocky Comfort Flat RNA, ID	NPS, IDCDC, 1989
<i>Alliostema virgata</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Alliostema virgata</i>	Status review	Koe, L.S.	BIT, DRL	MTNHP, 1992
<i>Anemone californica</i>	Status survey	Melike, R.	OD, Mahr	ODA, for BLM, 1990
<i>Anemone californica</i>	Status report	Atwood, D.	ID	IDCDC, 1980
<i>Arabis fecunda</i>	Status report	Lesica, P.	MT	MTNHP, 1985
<i>Arabis fecunda</i>	Status report	Lesica, P.	MT	USFWS, MTNHP, 1993
<i>Arabis fecunda</i>	Status report	Schasberger, L.A.	MT	USFWS, MTNHP, 1988
<i>Arabis fecunda</i>	Status report	Schasberger, L.A.	BVR	MTNHP, 1990
<i>Arabis fecunda</i>	Status report update	Schasberger, L.A.	MT	MTNHP, 1990
<i>Arenaria campestris</i> var. <i>wormfoldii</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1989
<i>Asplenium trichomanes</i>	Status report	Calico, S.L.	CLW	IDCDC, 1987
<i>Astragalus amblytropis</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Astragalus amblytropis</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Astragalus anserinus</i>	Status report	Baird, G.I., J. Tuhy, M.A. Franklin	UT, ID	UTNHP, BLM, 1990
<i>Astragalus anserinus</i>	Status report	Mancuso, M., R.K. Moseley	ID, UT	IDCDC, 1991
<i>Astragalus applegatei</i>	Status report	Yamamoto, S.	EC, Klam	ONHP, 1985
<i>Astragalus argutus</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Astragalus columbianus</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1990
<i>Astragalus glaberrimus</i>	Status report	Cholewa A.F.	ID NH, Engineering Lab. site, ID	U of ID Herbarium, 1982
<i>Astragalus paysonii</i>	Status report	Calico, S.L.	NEZ	IDCDC, 1985
<i>Astragalus venillifera</i> var. <i>mobilia</i>	Status report	Moseley, R.K.	ID	IDCDC, 1994
<i>Astragalus yoder-williamsii</i>	Status report	Mancuso, M., R.K. Moseley	ID	IDCDC, IDP&R, 1993
<i>Botrychium crenulatum</i>	Status report	Bernatas, S.	WAW	IDCDC, 1988
<i>Botrychium lanceolatum</i> var. <i>lanceolatum</i>	Status report	Bernatas, S.	WAW	IDCDC, 1988
<i>Botrychium manganense</i>	Status report	Bernatas, S.	WAW	IDCDC, 1988
<i>Botrychium pumilio</i>	Status report	D. Wagner, S. Vriekas	EC	ONHP, 1988
<i>Calamagrostis tweedyi</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1990
<i>Calochortus nitidus</i>	Status report	Calico, S.L.	NEZ	IDCDC, 1987
<i>Calochortus nitidus</i>	Status report	Calico, S.L.	CLW	IDCDC, 1988
<i>Calochortus nitidus</i>	Status report	Calico, S.L.	ID	IDP&R, IDCDC, 1988
<i>Cardamine costaricensis</i>	Status report	Calico, S.L.	NEZ	IDCDC, 1987
<i>Cardamine costaricensis</i>	Status report	Calico, S.L.	Aquarius NRA, ID	NPS, IDCDC, 1987
<i>Carex aenea</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Carex buxbaumii</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Carex californica</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Carex californica</i>	Status report	Calico, S.L.	NEZ	IDCDC, 1989
<i>Carex flava</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Carex hendersonii</i>	Status report	Calico, S.L.	Aquarius NRA, ID	NPS, IDCDC, 1987
<i>Carex hendersonii</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Carex leucocarpa</i>	Status report	Lesica, P.	MT	Glacier N.P., 1988
<i>Carex leucocarpa</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Carex peruviana</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Carex tumulicola</i>	Status report	Calico, S.L.	PAN	IDCDC, 1988
<i>Castilleja chlorotica</i>	Status report	Popovich, J.J.	FRE	1990
<i>Castilleja chlorotica</i>	Status report	Atwood, D.	ID	IDCDC, 1984
<i>Castilleja cryptantha</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1990

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Taxon	Title	Author	Area	On File at...Date
<i>Castilleja christi</i>	Status report	Moseley, R.K.	Albion Mtns, SAW, City of Rocks Ntl. Preserve	JD SAW, IDCDC, 1991
<i>Chaenactis cauckii</i>	Status report	Moseley, R.K.	ID	BSE, IDCDC, 1994
<i>Cymopterus douglasii</i>	Status report	Atwood, D.	ID	IDCDC, 1983
<i>Cymopterus davisi</i>	Status report	Moseley, R.K.	Albion Mtns, SAW, City of Rocks Ntl. Preserve	JD SAW, IDCDC, 1991
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Status report	Chadde, S.	KOO	IDCDC, 1989
<i>Cypripedium fasciculatum</i>	Status report	Calico, S.L.	Aquarius NRA, ID	NPS, IDCDC, 1987
<i>Cypripedium fasciculatum</i>	Status report	Calico, S.L.	CLW	IDCDC, 1988
<i>Cypripedium passerinum</i>	Status review	Shelley, J.S.	FLT, Lewis & Clark NF	MTNHP, 1988
<i>Dasynotus dimorphanthus</i>	Status report	Calico, S.L.	NEZ	IDCDC, 1989
<i>Delphinium viridescens</i>	Status report (revision)	Gamon, J.	USFWS, WA	WANHP, 1987
<i>Douglasia idahoensis</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Draba trichocarpa</i>	Status report	Calico, S.L.	ID	IDCDC, 1988
<i>Epilactis gigantea</i>	Status review	Schassberger, L.A.	FLT	MTNHP, 1988
<i>Eriogonum basalticum</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1988
<i>Eriogonum lachschewitzii</i>	Status review	D. Pavak, L.A. Schassberger	MT	Gallatin N.F., MT, 1990
<i>Eriogonum lachschewitzii</i>	Status report	Heidel, B.L.	MT	USFWS, MTNHP, 1993
<i>Eriogonum lachschewitzii</i>	Status report	Heidel, B.L.	USFWS	MTNHP, 1993
<i>Eriogonum salomonense</i>	Status report	Jancouse, M., R.K. Moseley	ID	IDCDC, 1992
<i>Eriogonum chrysops</i>	Status report	Wright, C.	OU	ONHP, 1989
<i>Goodyera repens</i>	Status report update	Achuff, P.L.	Lewis & Clark NF	MTNHP, 1992
<i>Goodyera repens</i>	Status review	Schassberger, L.A., P. Achuff	Lewis & Clark NF	MTNHP, 1991
<i>Grindelia howellii</i>	Status report update	D.S. Pavak	MT	USFWS, MTNHP, 1991
<i>Grindelia howellii</i>	Status report	Shelley, J.S.	MT	MTNHP, 1986
<i>Grindelia howellii</i>	Status review	USFWS	MT	USFWS, 1980
<i>Grindelia howellii</i>	Status report	Watson, T.J., C20 Jr.	MT	MTNHP
<i>Hackelia crumquittii</i>	Status report	Yamamoto, S., J. Kagan	OU, Malh	ONHP, 1985
<i>Hackelia venusta</i>	Status report (revision)	Gamon, J.	USFWS, WA	WANHP, 1988
<i>Halmolobos perkinsii</i> var. <i>perkinsii</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Haplopappus linearis</i>	Status report	Atwood, D.	ID	IDCDC, 1983
<i>Haplopappus lineariformis</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1991
<i>Haplopappus radicans</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Haplopappus radicans</i>	Status report	Kaye, T., S. Massey, W. Messinger, R. Meinke, T. Magee	BM, OU, Bala, Malh	ODA, BLM, 1990
<i>Hovelia aquatilis</i>	Status report	Gamon, J.	USFWS, WA	WANHP, 1992
<i>Hovelia aquatilis</i>	Status report update	Roe, L.S., C95, J.S. Shelley	MT	FLT, MTNHP, 1992
<i>Hovelia aquatilis</i>	Status review	Shelley, J.S.	FLT	USFWS, MTNHP, 1988
<i>Hovelia aquatilis</i>	Status review addendum	Shelley, J.S.	FLT	MTNHP, 1988
<i>Hovelia aquatilis</i>	Status report update	Shelley, J.S., L.A. Schassberger	USFS, MTNHP, 1989	
<i>Hovelia aquatilis</i>	Status report update	Shelley, J.S., L.A. Schassberger	MT	FLT, MTNHP, 1990
<i>Hovelia aquatilis</i>	Status report	Shelley, J.S., L.A. Schassberger	MT	FLT, MTNHP, 1991
<i>Hovelia aquatilis</i>	Status report	Shelley, J.S., R. Moseley	OR, WA, MT, ID	ONHP, 1988
<i>Lepidium davisi</i>	Status report	DeBolt, A., J. Doremus	BOI	IDCDC, 1989
<i>Lepidium papilliferum</i>	Status report	Moseley, R.K.	ID	IDF&R, USFWS, IDCDC, 1994
<i>Lesquerella carinata</i>	Status report	Vanderhorst, J.	BLM, USFWS	MTNHP, 1993
<i>Lesquerella carinata</i> , L. <i>paysonii</i>	Status review	Schassberger, L.A.	MT	OKL, MTNHP, 1991
<i>Lesquerella carinata</i> , L. <i>paysonii</i>	Status review	Schassberger, L.A.	DLR	MTNHP, 1991
<i>Lesquerella humilis</i>	Status report	Shelley, J.S.	BIT	MTNHP, 1988
<i>Lesquerella humilis</i>	Status report	Shelley, J.S., P.L. Achuff	MT	USFWS, MTNHP, 1990
<i>Lunatum erythraeum</i>	Status report	Meinke, R.	BM, Bake	1987, ONHP
<i>Lunatum greenum</i>	Status report	Meinke, R., T. Kaye	BM, Walt	Unpublished at ONHP
<i>Monarda mollis</i>	Status report	Greenleaf, J.	ID	IDCDC, 1980
<i>Monarda mollis</i>	Status report	Lichthardt, J.J.	IDF&O	IDF&O, 1992
<i>Monarda mollis</i>	Status review	Roe, L.S.	LOL	MTNHP, 1991
<i>Arnica latifolia</i>	Status report	Calico, S.L.	CLW	IDCDC, 1987
<i>Arnica latifolia</i>	Status report	Calico, S.L.	NEZ	IDCDC, 1987

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Taxon	Title	Author	Area	On File at...Date
<i>Minulus clivicola</i>	Status report	Caico, S.L.	Aquarius NRA, ID	NPS, IDCDC, 1987
<i>Minulus clivicola</i>	Status report	Caico, S.L.	CLW	IDCDC, 1988
<i>Minulus clivicola</i>	Status report	Gamon, J.	USFWS, WA	WANH, 1993
<i>Oxytheca dendroidea</i>	Status report	Cholewa A.F.	ID Ntl. Engineering Lab. site, ID	U of ID Herbarium, 1982
<i>Peristemon compactus</i>	Status report	Atwood, D.	ID	IDCDC, 1988
<i>Peristemon glaucus</i>	Status report	Popovich, S.J.	FRE	on file @ GNHP, 1990
<i>Peristemon lakowalei</i>	Status report	Baird, G.I., J. Tuby, M.A. Franklin	UT, ID	UTNHP, BLM, 1990
<i>Peristemon lakowalei</i>	Status report	Mancuso, M., R.K. Moseley	ID, UT	IDCDC, 1991
<i>Peristemon lemhnensis</i>	Status report	ACZ, Inc.	SAL	SAL, 1990
<i>Peristemon lemhnensis</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Peristemon lemhnensis</i>	Status survey	Moseley, R.K.C154, M. Mancuso, J. Hilly	ID	IDNHP, IDFG
<i>Peristemon lemhnensis</i>	Status report	Shelly, J.S.	MT	USFWS, MTNHP, 1990
<i>Peristemon lemhnensis</i>	Status review	Shelly, J.S.	MT	USFS, MTNHP, 1990
<i>Peristemon lemhnensis</i>	Status survey	Shelly, J.S.	BVR, BIT	MTNHP, 1987
<i>Pentstemon cinerascens</i>	Status report	Gamon, J.	USFWS, WA	WANH, 1989
<i>Phlox kelleyi</i> var. <i>missouensis</i>	Status report	Gamon, J.	USFWS, WA	WANH, 1986
<i>Polemonium pacificum</i>	Status review	Schamberger, L.A., P. Achuff	Lewis & Clark NF	MTNHP, 1991
<i>Pulsatilla nuttalliana</i>	Status report	Gamon, J.	USFWS, WA	WANH, 1985
<i>Ranunculus acris</i>	Status report	Schiller, R., N. Sprague	WA	NPS, IDCDC, 1987
<i>Rorippa columbiana</i>	Status report	Scherer, N.	Pierce Island, CR	for USFWS by WANH, 1985
<i>Rubus nigerrimus</i>	Status report	Gamon, J.	USFWS, WA	TNC, WA, 1991
<i>Silene acaulis</i>	Status report	Atwood, D., N. Charlesworth	ID	WANH, 1989
<i>Silene acaulis</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Silene acaulis</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Scirpus subterminalis</i>	Status report	Chadler, S.	KOO	IDCDC, 1989
<i>Senecio erigeron</i>	Status report	Kays, T., W. Messinger, S. Massey	OU, Malb	for USFWS by ODA, 1991
<i>Sidalcea oregana</i> var. <i>caha</i>	Status report	Gamon, J.	USFWS, WA	WANH, 1987
<i>Silene acaulis</i>	Status report	Arnett, J., J. Gamon	USFWS, WA	WANH, 1991
<i>Silene spaldingii</i>	Status report	Gamon, J.	WA	WANH, 1991
<i>Silene spaldingii</i>	Status report	Gamon, J.	USFWS, WA	WANH, 1991
<i>Silene spaldingii</i>	Status report	Lorain, C.	ID	IDFG, 1991
<i>Silene spaldingii</i>	Status report	Schamberger, L.A.	BM, Wall	ONHP, 1988
<i>Sisyrinchium artemisioides</i>	Status report	Gamon, J., N. Sprague	WA	WANH, 1986
<i>Sisyrinchium artemisioides</i>	Status report	Gamon, J., N. Sprague	USFWS, WA	WANH, 1986
<i>Synthyris plicatipes</i>	Status report	Caico, S.L.	NEZ	IDCDC, 1989
<i>Tauschia hawaii</i>	Status report	Gamon, J., D. Salstrom	USFWS, WA	WANH, 1993
<i>Thelypodium hawaii</i> ssp. <i>spectabile</i>	Status report	Kagan, J.	BM, OU, Baker, Malb, Unio	for USFWS by GNHP, 1985
<i>Thelypodium repandum</i>	Status report	Caico, S.L.	ID	IDCDC, 1987
<i>Thelypteris nevadensis</i>	Status report	Caico, S.L.	Aquarius NRA, ID	NPS, IDCDC, 1987
<i>Tufieldia glutinosa</i> ssp. <i>abrona</i>	Status report	Atwood, D., N. Charlesworth	ID	IDCDC, 1987
<i>Tridentella latifolia</i>	Status report	Caico, S.L.	Aquarius NRA, ID	NPS, IDCDC, 1987
<i>Trifolium thompsonii</i>	Status report(revision)	Gamon, J.	USFWS, WA	WANH, 1988

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Taxon	Report Type	Author	Area/Subject	Area/File/Publication
<i>Crypta baieri idahoensis</i>	Botanical survey	Hill, J.L.	Wapshilla Ridge area/ Craig Mtn., ID	IDCDC, 1991
<i>Cryptantha coccinea</i>	Field guide	Atwood, D. J. Holland, R. Bolander	Intermountain region	USDANF, Ogden, Ut., 1991
<i>Cryptantha simulans</i>	Technical report	Johnson, C.G., S.A. Simon	WAW, Wallows-Snake province	WAW, R6-ECOL-TP-255A-86, 1987
<i>Cypripedium fasciculatum</i>	Technical report	Brownell, V.R.	Distribution	IDCDC, 1985
<i>Cypripedium calceolus</i>	Botanical survey	Holmans, T.	Fortine RD, KOO	KOO, 1992
<i>Cypripedium calceolus</i>	Field survey	Heidel, B.L.	Anderson Hill, MT.	1992
<i>Cypripedium calceolus var. parviflorum</i>	Botanical survey	Lesica, P.	Pine Butte Reserve, MT	MTNHP, 1991
<i>Cypripedium calceolus var. parviflorum</i>	Botanical survey	Chadde, S.L.	Finkham analysis area, Fortine & Resford Rds, KOO	KOO, 1991
<i>Cypripedium calceolus var. parviflorum</i>	Botanical survey	Heidel, B.	Garnet Resource area, BUT	MTNHP, 1992
<i>Cypripedium calceolus var. parviflorum</i>	Botanical survey	Poole, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Cypripedium fasciculatum</i>	Botanical survey	Moseley, B.	Aquarius Research Natural Area, ID	TNC, 1988
<i>Cypripedium fasciculatum</i>	Field guide	Atwood, D. J. Holland, R. Bolander	Intermountain region	USDANF, Ogden, Ut., 1991
<i>Cypripedium fasciculatum</i>	Field survey	Moseley, B.	Bronco Beauty analysis area, CDANF	IDCDC, 1992
<i>Cypripedium fasciculatum</i>	Thesis	Crawford, R.C.	North-central ID	U of ID, 1983
<i>Cypripedium passerinum</i>	Botanical survey	Holtana, T.	Fortine RD, KOO	KOO, 1992
<i>Cypripedium passerinum</i>	Botanical survey	Horn, F.	Headwaters Resource Area, BUT	BUT, 1980
<i>Cypripedium passerinum</i>	Field survey	Shelly, J.S.	Levis & Clark, Pooders, and Meagher Co's, MT	1986
<i>Cypripedium passerinum</i>	Field survey	Shelly, J.S.	Bob Marshall Wilderness, MT	1988
<i>Cypripedium passerinum</i>	Field survey	Shelly, J.S.	Rocky Mtn. Front range, MT	1988
<i>Dasymotis duboisi</i>	Monitoring report	Crawford, R.C.	Northern ID	U of ID, 1980
<i>Dasymotis duboisi</i>	Botanical survey	Johnson, F.S., R.C. Crawford	N. ID	U of ID, 1978
<i>Draba apiculata</i>	Botanical survey	Fox, L., R.K. Moseley	White Cloud Peaks, Boulder Mtns., ID	IDCDC, 1991
<i>Draba densifolia</i>	Botanical survey	Heidel, B., J. Vanderhorst	Tobacco Root mtns., BVR, DRL	BVR, DRL, 1991
<i>Draba densifolia</i>	Botanical survey	Poole, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Draba incana</i>	Botanical survey	Fox, L., R.K. Moseley	White Cloud Peaks, Boulder Mtns., ID	IDCDC, 1991
<i>Draba iridocarpa</i>	Monitoring report	Moseley, R.K., M. Mancuso	Stanley Basin, ID	SAW, IDCDC, 1993
<i>Draba iridocarpa</i>	Monitoring report	Moseley, R.K., M. Mancuso	Stanley Basin, ID	1987
<i>Dryopteris cristata</i>	Field survey	Shelly, J.S.	Indian meadows, MT	XIV International Botanical Conference, 1987
<i>Dryopteris cristata</i>	Field investigation	Caico, S.L.	PAN	IDNHP, IDFG, 1987
<i>Eleocharis rustellana</i>	Botanical survey	Heidel, B.	Bluewater Fish Hatchery, MT.	MDFWP, 1994
<i>Eleocharis rustellana</i>	Botanical survey	Lesica, P.	Pine Butte Reserve, MT	MTNHP, 1991
<i>Eleocharis rustellana</i>	Unpublished report	Heidel, B.	Bluewater fish hatchery (MDFWP)	MTNHP, no date
<i>Eleocharis rustellana</i>	Botanical survey	Vanderhorst, J., B.L. Heidel	Tobacco Root mtns., Madison Co., MT	BVR, DRL, MTNHP, 1995
<i>Epilobium palustre</i>	Botanical survey	Henderson, D.M.	Sawtooth Lake Botanical Area, SHS	SHS, 1987
<i>Epipactis gigantea</i>	Botanical survey	Poole, J.M., B.L. Heidel	Chia, Middle fork RD	USF Herbarium, 1982
<i>Epipactis gigantea</i>	Botanical survey	Vanderhorst, J., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Epipactis gigantea</i>	Botanical survey	Vanderhorst, J., B.L. Heidel	Tobacco Root mtns., Madison Co., MT	BVR, DRL, MTNHP, 1995
<i>Epipactis gigantea</i>	Field survey	Achuff, P.L.	Swan valley peatlands, Lake co., MT.	1991
<i>Epipactis gigantea</i>	Field survey	Schaesberger, L.A.	Flathead & Lake co's, MT.	1988
<i>Epipactis gigantea</i>	Status Publication	Brunton, C.F.	Canada	Canadian Field Naturalist. 100:414-417
<i>Epipactis gigantea</i>	Thesis	Mantis, M.	Ecology and Reproductive biology	University of Idaho, 1993
<i>Erigeron lachneanthi</i>	Field survey	Heidel, B.L.	Crown Mt., MT.	1992
<i>Erigeron lachneanthi</i>	Field survey	Heidel, B.L.	Steamboat Mt. Lookout, MT.	1992
<i>Erigeron lachneanthi</i>	Field survey	Heidel, B.L.	Swift Reservoir, MT.	1992
<i>Erigeron lachneanthi</i>	Field survey	Heidel, B.L., H.W. Phillips	Washboard Reef, MT.	1992
<i>Erigeron lachneanthi</i>	Field survey	Heidel, B.L., T. & H. Karstetter	Mr. Wright, MT.	1992
<i>Erigeron lachneanthi</i>	Field survey	Schaesberger, L.A.	Our Lake, MT.	1989
<i>Erigeron lachneanthi</i>	Interim taxonomy report	Karstetter, T.	Front range Mtns., MT	MTNHP, 1994
<i>Erigeron lachneanthi</i>	Interim taxonomy report	Karstetter, T.	MT	MTNHP, 1994
<i>Erigeron lachneanthi</i>	Interim taxonomy report	Karstetter, T.	USFWS	MTNHP, 1994

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Taxon	Report Type	Author	Area/Subject	Area/File/Publication
<i>Erigeron lackawottii</i>	Masters thesis	Kerstetter, T.	MT	MSU, Bozeman, MT, 1994
<i>Erigeron lackawottii</i>	Masters thesis	Kerstetter, T.	Taxonomic investigation	Montana State University, 1994
<i>Erigeron lackawottii</i>	New species report	Fertig, W.	BRT	Wyoming TNC, 1993
<i>Erigeron lackawottii</i>	Preliminary taxonomy report	Kerstetter, T.	MT	USFWS, MTNHP, 1993
<i>Erigeron lackawottii</i>	Preliminary taxonomy report	Kerstetter, T.	USFWS	MTNHP, 1993
<i>Eriogonum melodesum</i>	Monitoring report	Moseley, R.K., M. Mancuso	Stanley Basin, ID	IDCDC, 1991
<i>Eriophorum viridicarinatum</i>	Botanical survey	Johnston, B.C.	Swamp Lake Botanical Area, SHS	SHS, 1987
<i>Eriophorum viridicarinatum</i>	Botanical survey	Lesica, P.	Pine Bute Reserve, MT	MTNHP, 1991
<i>Eriophorum viridicarinatum</i>	Botanical survey	Moseley, R.K.	Fremont & Teton Co's., ID	IDFG, 1991
<i>Gaultheria ovalifolia</i>	Masters thesis	Lerain, C.C.	History & distribution of coastal disjunct plants	University of Idaho, 1988
<i>Gentiana prostrata</i>	Botanical survey	Achuff, P.L., L.S. Roe	Gost Flat proposed research natural area, DRL	DRL, MTNHP, No date
<i>Gentianopsis simplex</i>	Field survey	Held, B.L.	Lima fm, MT.	1992
<i>Gentianopsis simplex</i>	Field survey	Shelly, J.S.	Carbon Co., MT	1989
<i>Goodyera repens</i>	Botanical survey	Pool, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Goodyera repens</i>	Field survey & monitoring	Schassberger, L.A.	Little belt mtns., MT	1990
<i>Grindelia howellii</i>	Field investigation	Calton, S.L.	PAN	IDNHP, IDFG, 1987
<i>Grindelia howellii</i>	Lecture	Achuff, P.L., L.A. Schassberger	Weeds and Rare Native Plants in MT.	Proc. Weed Symposium, 1992
<i>Grindelia howellii</i>	Population monitoring	Krutz, A.	LOL	Seely Lake, MT, 1989
<i>Hallimalobos perplexus</i> var. <i>perplexus</i>	Technical report	Johnson, C.G., S.A. Simon	WAW, Wallows-Snake province	WAW, RS-ECOL-TP-255A-86, 1987
<i>Haplopappus insecticurtus</i>	Botanical survey	Eidemiller, B.J.	SHS	IDCDC, 1977
<i>Haplopappus macfarlanei</i>	Inventory	Moseley, R.K.	Lower Salmon River, CDA	CDA, IDCDC, 1993
<i>Haplopappus macronema</i> var. <i>macronema</i>	Botanical survey	Schassberger, L.A.	East Pioneer Mtns., BVR	MTNHP, 1991
<i>Haplopappus macronema</i> var. <i>macronema</i>	Field survey	D. Pavik	Pioneer Mtns., MT	1990
<i>Haplopappus radicans</i>	Field investigation	Mancuso, M.	PAY	IDCDC, 1991
<i>Heterocodon naniflorum</i>	Botanical survey	Schassberger, L.A.	East Pioneer Mtns., BVR	MTNHP, 1991
<i>Howellia aquatilis</i>	Abstract	Shelly, J.S.	Lack & Missoula counties, Mt.	Proc. Mont. Acad. Sci. 48:12, 1988
<i>Howellia aquatilis</i>	Ecological assessment	Lesica, P.	Swan valley, Mt.	FLT, Conservation biology research, 1990
<i>Howellia aquatilis</i>	Masters thesis	Rice, D.J.	MT	WSU, Pullman, Wa. 1990
<i>Howellia aquatilis</i>	Monitoring progress report	Lesica, P.	Swan river oxbow preserve, MT.	MTNC, 1991
<i>Howellia aquatilis</i>	Monitoring progress report	Lesica, P.	Swan river oxbow preserve	MTNC, 1994
<i>Howellia aquatilis</i>	Population report	Lesica, P., R.F. Leary, F.W. Allendorf	MT	MTNC, 1987
<i>Hutchinsia procumbens</i>	Botanical survey	Vanderhorst, J.P.	Tendoy mtns., Beaverhead Co., MT	BUT, MTNHP, 1994
<i>Juncus covillei</i>	Ecological assessment	Vanderhorst, J.P.	Southcentral MT	MDFWP, MTNHP, 1993
<i>Juncus halii</i>	Botanical survey	Lesica, P.	Highland Mtns., DRL	MTNHP, 1992
<i>Juncus halii</i>	Botanical survey	Pool, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Juncus halii</i>	Environmental analysis	OEIA research	Beal Mining Co., German Gulch, MT	OEIA, 1981
<i>Juncus halii</i>	Field survey	Pool, J.M.	Elkhorn & Big Belt Mtns., Helena NF, MT	Helena NF, 1992
<i>Juncus halii</i>	Plant survey	Dieffenbach, T.	Caribou Mountains, ID	IDCDC, 1977
<i>Kobresia simpliciflora</i>	Botanical survey	Johnston, B.C.	Swamp Lake Botanical Area, SHS	SHS, 1987
<i>Lepidium davallii</i>	Botanical survey	Eidemiller, B.J.	SHS	IDCDC, 1977
<i>Lepidium davallii</i>	Monitoring report	Bernatis, S., R.K. Moseley	Mountain Home AFB, ID	IDCDC, 1991
<i>Lepidium davallii</i>	Monitoring report	DeBolt, A., J. Doremus	BOI	IDCDC, 1990
<i>Lepidium davallii</i>	Monitoring report	Doremus, J., A. DeBolt	Kuna Planning area, BOI	BOI, 1987
<i>Lepidium papilliferum</i>	Botanical survey	Moseley, R.K., M. Mancuso, J. Hilty	Boise Foothills, Ada county, ID	IDCDC, 1992
<i>Leptodactylon pungens</i> ssp. <i>hastellae</i>	Field survey	Moseley, R.K.	Helix Canyon Ntnl. Recreation Area, CDANF	IDCDC, 1992
<i>Lesquerella carinata</i>	Field survey	D. Pinks	MT	1190
<i>Lesquerella carinata</i>	Field survey	Heidel, B.L.	Ranier Gulch, MT.	1992
<i>Lesquerella carinata</i>	Field survey	Schassberger, L.A.	Granite Co., MT	1989
<i>Lesquerella carinata</i>	Field survey	Schassberger, L.A.	Granite Co., MT	1990
<i>Lesquerella carinata</i>	Lecture	Achuff, P.L., L.A. Schassberger	Weeds and Rare Native Plants in MT.	Proc. Weed Symposium, 1992
<i>Lesquerella carinata</i> var. <i>longipila</i>	Unpublished report	Greenlee, J.	Conservation Biology	TNC, 1994

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Taxon	Report Type	Author	Area/Subject	Area/File/Publication
<i>Polygonum douglasii</i> ssp. <i>ausinae</i>	Botanical survey	Heidel, B., J. Vanderhorst	Tobacco Root mtns., BVR, DRL	BVR, DRL, 1994
<i>Polygonum douglasii</i> ssp. <i>ausinae</i>	Botanical survey	Vanderhorst, J., B.L. Heidel	Tobacco Root mtns., Madison Co., MT	BVR, DRL, MTNHP, 1995
<i>Polygonum douglasii</i> ssp. <i>ausinae</i>	Field survey	Heidel, B.L.	Hunters Gulch, Helena NF, MT	Helena NF, 1992
<i>Polygonum douglasii</i> ssp. <i>ausinae</i>	Field survey	Heidel, F.L.C291, P. Lesica	Pike Gulch & Burnt Creek, Helena NF, MT	Helena NF, 1992
<i>Polystichum kruckebergii</i>	Botanical survey	Achuff, P.L., L.S. Roe	Goat Flat proposed research natural area, DRL	DRL, MTNHP, No date
<i>Polystichum obtusifolius</i>	Field survey	Watson, L.	near Cynnet Lake, MT	BUT, MTNHP, 1994
<i>Psoralea tenuifolia</i>	Botanical survey	Vanderhorst, J., B.L. Heidel	Tobacco Root mtns., Madison Co., MT	BVR, DRL, MTNHP, 1995
<i>Primula alpestris</i>	Ecological and Floristic inventory	Moseley, R.K.	Birch Creek Fes. Lemhi and Clark Co's, ID	TAR, SHN, IDCDC, 1992
<i>Ranunculus jonesii</i>	Field survey	Heidel, B.L.	Targhee Pass, MT.	1992
<i>Ranunculus verecundus</i>	Botanical survey	Lesica, P.	Highland Mtns., DRL	MTNHP, 1992
<i>Rubus bartramianus</i>	Field survey	Moseley, R.K.	Hells Canyon Nml. Recreation Area, CDANF	IDCDC, 1992
<i>Rubus bartramianus</i>	Species guide	Bingham, R.T., D.M. Henderson	Hells Canyon, GR	Helena Canyon NRA, 1980
<i>Salix candida</i>	Botanical survey	Johnston, B.C.	Swamp Lake Botanical Area, SHS	SHS, 1987
<i>Salix candida</i>	Field guide	Brunsfeld, S.J., F.D. Johnson	East-Central Idaho	U of ID, 1985
<i>Salix cascadenis</i>	Botanical survey	Achuff, P.L., L.S. Roe	Goat Flat proposed research natural area, DRL	DRL, MTNHP, No date
<i>Salix cascadenis</i>	Ecological assessment	Vanderhorst, J.P.	Southernmost MT	MDFWP, MTNHP, 1993
<i>Salix cascadenis</i>	Field survey	Vanderhorst, J.	Gallatin NF	MTNHP, 1993
<i>Salix goricea</i>	Field guide	Brunsfeld, S.J., F.D. Johnson	East-Central Idaho	U of ID, 1985
<i>Salix wolfii</i> var. <i>wolfii</i>	Ecological assessment	Vanderhorst, J.P.	Southernmost MT	MDFWP, MTNHP, 1993
<i>Salix wolfii</i> var. <i>wolfii</i>	Botanical survey	Achuff, P.L., L.S. Roe	Goat Flat proposed research natural area, DRL	DRL, MTNHP, No date
<i>Salix wolfii</i> var. <i>wolfii</i>	Botanical survey	Mathews, S.	Gallatin NF	USFS, MTNHP, 1989
<i>Salix wolfii</i> var. <i>wolfii</i>	Botanical survey	Poole, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Salix wolfii</i> var. <i>wolfii</i>	Field survey	Vanderhorst, J.	Gallatin NF	MTNHP, 1993
<i>Sanicula marilandica</i>	Botanical survey	BioSystems Analysis, Inc.	POT-PGE&E Pipeline, ID, WA, OR, CA	BioSystems Analysis Inc., 1990
<i>Satureia douglasii</i>	Field survey	Achuff, P.L.	Ninemile valley, Missoula co., MT.	1991
<i>Suastraea weberi</i>	Botanical survey	Achuff, P.L., L.S. Roe	Goat Flat proposed research natural area, DRL	DRL, MTNHP, No date
<i>Suastraea weberi</i>	Botanical survey	Achuff, P.L., L.S. Roe	Goat Flat proposed research natural area, DRL	DRL, MTNHP, No date
<i>Suastraea weberi</i>	Botanical survey	Lesica, P.	Highland Mtns., DRL	MTNHP, 1992
<i>Suastraea weberi</i>	Botanical survey	Schamberger, L.A.	East Pioneer Mtns., BVR	MTNHP, 1991
<i>Suastraea weberi</i>	Field investigation	Calton, S.L.	PAN	IDNHP, IDFG, 1987
<i>Suastraea weberi</i>	Botanical survey	BioSystems Analysis, Inc.	POT-PGE&E Pipeline, ID, WA, GR, CA	BioSystems Analysis Inc., 1990
<i>Suastraea weberi</i>	Botanical survey	Moseley, R.K.	Fremont & Teton Co's, ID	IDFG, 1991
<i>Suastraea weberi</i>	Botanical survey	Lesica, P.	Pine Butte Reserve, MT	MTNHP, 1991
<i>Suastraea weberi</i>	Botanical survey	Chadde, S.	Pinkham analysis area, Fortine & Rexford Rds, KOO	KOO, 1991
<i>Suastraea weberi</i>	Botanical survey	Holtzma, T.	Fortine RD, KOO	KOO, 1992
<i>Suastraea weberi</i>	Botanical survey	Moseley, R.K.	Fremont & Teton Co's, ID	IDFG, 1991
<i>Suastraea weberi</i>	Field survey	Shelby, J.S.	Indian meadows, MT	1987
<i>Suastraea weberi</i>	Botanical survey	Vanderhorst, J.	Gallatin NF	Gallatin NF, MTNHP, 1994
<i>Suastraea weberi</i>	Ecological assessment	Vanderhorst, J.P.	Southernmost MT	MDFWP, MTNHP, 1993
<i>Suastraea weberi</i>	Field survey	Vanderhorst, J.	Gallatin NF	MTNHP, 1993
<i>Suastraea weberi</i>	Botanical survey	Poole, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Suastraea weberi</i>	Botanical survey	Schamberger, L.A.	East Pioneer Mtns., BVR	MTNHP, 1991
<i>Suastraea weberi</i>	Botanical survey	Johnson, F.S., R.C. Crawford	N. ID	U of ID, 1978
<i>Suastraea weberi</i>	Monitoring report	Crawford, R.C.	Northern ID	U of ID, 1980
<i>Suastraea weberi</i>	Technical bulletin	Daubenmire, R., J.B. Daubenmire	E. WA, N. ID	Tech. Bull. 60, WSU, 1968
<i>Suastraea weberi</i>	Technical report	Cooper, S.V., K.E. Neiman, R. Steele, D.W. Roberts	Northern ID	USDA, Ogden, UT, 1987
<i>Suastraea weberi</i>	Thesis	Crawford, R.C.	North-central ID	U of ID, 1983
<i>Thalictrum alpinum</i> var. <i>keckum</i>	Botanical survey	Vanderhorst, J.P.	Tendoy mtns., Beaverhead Co., MT	BUT, MTNHP, 1994
<i>Thalictrum sagittatum</i> var. <i>sagittatum</i>	Botanical survey	Vanderhorst, J.P.	Tendoy mtns., Beaverhead Co., MT	BUT, MTNHP, 1994
<i>Thlaspi puriflorum</i>	Botanical survey	Lesica, P.	Highland Mtns., DRL	MTNHP, 1992
<i>Thlaspi puriflorum</i>	Botanical survey	Vanderhorst, J.P.	Tendoy mtns., Beaverhead Co., MT	BUT, MTNHP, 1994

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Taxon	Report Type	Author	Area/Subject	Area/File/Publication
<i>Townsendia nuttallii</i>	Botanical survey	Vanderhorst, J.P.	Tendoy mtns., Beaverhead Co., MT	BUT, MTNHP, 1994
<i>Trifolium myohenneae</i>	Thesis	Grimes, J.W.	Leslie Gulch, Malheur Cty., OR.	Thesis, USU, 1979
<i>Vernutrum californicum</i>	Botanical survey	Poole, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993
<i>Viola renifolia</i>	Botanical survey	Poole, J.M., B.L. Heidel	Big Belt & Elkhorn Mtns., Helena NF, MT	Helena NF, MTNHP, 1993

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Topic	Author	Subject	Publication, Date
<i>Agoseris lachschewitzii</i>	Henderson, D.M., R.K. Moseley, A.F. Cholewa	Taxonomy	Systematic Botany, 15(3):462-465, 1990
<i>Allium acaule</i>	Holsinger, K.E.	Biology	C of I, IDCCD, 1978
<i>Allium fibrillum</i>	Badr, A., T.T. Elkington	Genetics topic	Plant Systematics and Evolution, 144:17-24, 1984
<i>Alliopsis virgata</i>	Castellano, M.A., J.M. Trappe	Biology	Mycologia, 77(3):499-502, 1985
<i>Alliopsis virgata</i>	Castellano, M.A., J.M. Trappe	Mycorrhizal associations	77(3):499-502, 1985
<i>Alliopsis virgata</i>	Copeland, H.F.	Genus Structure	Madrono 4:137-168, 1938
<i>Alliopsis virgata</i>	Copeland, H.F.	Biology	Madrono 4:137-153, 1938
<i>Alliopsis virgata</i>	Furman, T.E., J.M. Trappe	Biology	Quarterly Review of Biology, 46:219-225, 1971
<i>Alliopsis virgata</i>	Furman, T.E., J.M. Trappe	Phylogeny and Ecology	Quarterly Review of Biology, 46:219-225, 1971
<i>Alliopsis virgata</i>	Wallace, G.D.	Pollination ecology	Amer. Journal of Botany 64:199-206, 1977
<i>Anemone arcuata</i>	Cronquist, A.	Distribution, Taxonomy	Lits. of Western Botany, 6(2):41-56, 1950
<i>Anemone densifolia</i>	Bayer, R.J.	A systematic and phylogeographic study.....	Madrono 36:248-259, 1989
<i>Anemone densifolia</i>	Bayer, R.J.	Patterns of isozyme variation.....	Am. Journal of Botany 76:679-691, 1989
<i>Arabis fecunda</i>	Lesica, P., J.S. Shelley	MT	Am. Midl. Nat. 128:53-60, 1992
<i>Arnica alpina var. tomentosa</i>	Bridgland, F., J.M. Gillet	Distribution	Can. Field-Naturalist, 97(3):279-292, 1983
<i>Arnica alpina var. tomentosa</i>	Douglas, G.W., M.J. Ratcliffe	Distribution	Can. Journal of Botany, 56:1710-1711, 1978
<i>Aster javanicus</i>	Bates, V.	Taxonomy	Taxon, 35:170-171, 1986
<i>Aster javanicus</i>	Dean, M.L., K.L. Chambers	Genetics, Taxonomy	Brittonia, 35(3):189-196, 1983
<i>Aster javanicus</i>	Jones, A.G.	Taxonomy	Madrono, 31(2):113-122, 1984
<i>Aster javanicus</i>	Jones, A.G.	Taxonomy	Taxon, 36(1):142, 1987
<i>Astragalus amisi-amisi</i>	Henderson, D.M., S. Brunsfeld, P. Brunsfeld	Distribution	Madrono, 28(2):88-90, 1981
<i>Astragalus anserinus</i>	Atwood, N.D., S. Goodrich, S.L. Welch	Taxonomy	Great Basin Naturalist, 44(2):263-264, 1984
<i>Astragalus blanfordianus</i>	Clement, S.L., D.H. Miller	Biology	Pan-Pacific Entomologist, 58(1):38-41, 1982
<i>Astragalus gilviflorus</i>	Goodrich, S. D. Henderson, A. Cholewa	Distribution	Madrono, 30:63, 1983
<i>Astragalus leptolepis</i>	Calceo, S.L.	Distribution	Madrono, 30:64, 1983
<i>Astragalus riparius</i>	Barneby, R.C.	Taxonomy	Am. Midland Naturalist, 55(2):477-503, 1956
<i>Astragalus sterilis</i>	Barneby, R.C.	Taxonomy	Lits of Western Botany, 5(12):193-195, 1949
<i>Astragalus sterilis</i>	Grimes, J.W.	Community ecology, Distribution	Madrono, 31(2):80-85, 1984
<i>Astragalus vestitus</i>	Barneby, R.C.	Taxonomy	Am. Midland Naturalist, 55(2):477-503, 1956
<i>Astragalus yoder-williamsii</i>	Barneby, R.C.	Taxonomy	Brittonia, 32(1):30-32, 1980
<i>Bacopa rotundifolia</i>	Barrett, S.C.H., J.L. Strother	Distribution, Taxonomy	Systematic Botany, 3(4):408-419, 1978
<i>Benula pumila var. glandulifera</i>	Connelly-McCarthy, B.J., D.F. Grigal	Forest Science, 31(4):1011-1017, 1985	Distribution, Taxonomy
<i>Benula pumila var. glandulifera</i>	Braunsfeld, S.J., F.D. Johnson	Distribution, Taxonomy	Madrono, 33:147-148, 1986
<i>Benula pumila var. glandulifera</i>	Dugle, J.R.	Genetics, Taxonomy	Can. Journal of Botany, 44:929-1007, 1966
<i>Blechnum spicatum</i>	Coulters, M.L.	Biology, Community ecology	Diss. Abstracts Int. 34:08-B-3672, 1973
<i>Blechnum spicatum</i>	Chambers, K.L.	Distribution	Madrono, 22(3):105-114, 1973
<i>Blechnum spicatum</i>	Coulters, M.L.	Distribution	Botanical Gazette, 142(2):251-258, 1981
<i>Blapharidactylus kingii</i>	Hausler, A.T., A.M. Anton	Biology, Community ecology	Brittonia, 31(4):446-453, 1979
<i>Bostrychium lanceolatum var. lanceolatum</i>	Farrar, D.R., C.L. Johnson-Groh	Taxonomy	Am. Journal of Botany, 77(9):1168-1175, 1990
<i>Bostrychium minghamense</i>	Alverson, Ed.	Douglasia, 9(3):2-4	Taxonomy
<i>Bostrychium minghamense</i>	Farrar, D.R., C.L. Johnson-Groh	Am. Journal of Botany, 77(9):1168-1175, 1990	Biology
<i>Bostrychium pedunculatum</i>	Wagner, W.H. Jr., F.S. Wagner	American Fern Journal 76(2):33-47	OBM
<i>Bostrychium simplex</i>	Alverson, Ed.	Douglasia, 9(3):2-4	Taxonomy
<i>Bostrychium simplex</i>	Farrar, D.R., C.L. Johnson-Groh	Douglasia, 9(3):2-4	Biology
<i>Bostrychium sp.</i>	Paris, C.A., F.S. Wagner, W.H. Wagner	Am. Journal of Botany, 77(9):1168-1175, 1990	Cryptic species, delimitation, taxonomy
<i>Bostrychium sp.</i>	Vil, S.P., G.C. Gupta	Amer. Fern Journal 79:46-54, 1989	New species
<i>Bostrychium sp.</i>	Wagner, W.H. Jr., F.S. Wagner	Amer. Fern Journal 71:20-30, 1981	New species
<i>Bostrychium sp.</i>	Wagner, W.H. Jr., F.S. Wagner	Amer. Fern Journal 76(2):33-47, 1986	Notes
<i>Bostrychium sp.</i>	Wagner, W.H. Jr., F.S. Wagner	Amer. Fern Journal 80:73-81, 1990	

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Taxon	Author	Subject	Publication, Date
<i>Barrychium</i> sp.	Wagner, W.H. Jr., F.S. Wagner, C. Haufler, J.K. Emerson	New nothospecies	Can. Journal of Botany 62:629-634, 1984
<i>Barrychium crenulatum</i>	Alverson, Ed.	Taxonomy	Douglasia. 9(3):2-4
<i>Calochortus nitidus</i>	Caloco, S.L.	Biology, Monitoring	Northwest Science. 64(2):108, Abstract # 71, 1990
<i>Calochortus nitidus</i>	Henderson, L.F.	Distribution, Taxonomy	Torrey Botanical Club. 27:342-359, 1900
<i>Carex brevifol. pallidensis</i>	Howell, J.T.	Taxonomy	Lfts. of Western Botany. 2(2):36-40, 1947
<i>Carex buxbaumii</i>	Bogs, K., P. Hansen, R. Pfister, J. Joy	Community ecology	U of MT, 1990
<i>Carex buxbaumii</i>	Hansen, P., K. Bogs, R. Pfister, J. Joy	Community ecology	UofM, Missoula, MT., 1990
<i>Carex buxbaumii</i>	Hansen, P., S. Chaddé, R. Pfister, J. Joy, D. Svoboda, J. Pierce, L. Myers	Community ecology	UofM, Missoula MT., 1988
<i>Carex buxbaumii</i>	Hansen, P.L., S.W. Chaddé, R.D. Pfister	Community ecology, Distribution, Mgmt. techniques	Uof M. Publ. 49, Missoula, MT., 1988
<i>Carex chardorrhiza</i>	Bernard, J.M.	Biology	Can. Journal of Botany. 68:1441-1448, 1989
<i>Carex chardorrhiza</i>	Bowles, M.L., M.M. DeMauro, N. Pavlovic, R.D. Hiebert	Community ecology, Management techniques	Natural Areas Journal. 10(4):187-200, 1990
<i>Carex chardorrhiza</i>	Fernald, M.L.	Distribution	Rhodora. 21(243):41-67, 1919
<i>Carex chardorrhiza</i>	Schuyler, A.E.	Glacier NP	Rhodora 82:519, 1980
<i>Carex comosa</i>	Bernard, J.M.	Biology	Can. Journal of Botany. 68:1441-1448, 1989
<i>Carex comosa</i>	Bryson, C.T.	Distribution	Sida. 14(2):311-312, 1990
<i>Carex flava</i>	Bernard, J.M.	Biology	Can. Journal of Botany. 68:1441-1448, 1989
<i>Carex flava</i>	Crisis, W.J., F.W. Ball	Taxonomy	Can. Journal of Botany. 67:1048-1065, 1989
<i>Carex flava</i>	Hansen, P.L., S.W. Chaddé, R.D. Pfister	Community ecology, Distribution, Mgmt. techniques	Uof M. Publ. 49, Missoula, MT., 1988
<i>Carex flava</i>	Howell, J.T.	Distribution	Lfts. of Western Botany. 4(8):206-208, 1945
<i>Carex flava</i>	Johnson, F.D., S.J. Brunsfeld	Distribution	Madrono. 30:259, 1983
<i>Carex leptalea</i>	Hansen, P.L., S.W. Chaddé, R.D. Pfister	Community ecology, Distribution, Mgmt. techniques	Uof M. Publ. 49, Missoula, MT., 1988
<i>Carex livida</i>	Cooper, D.J.	Community ecology, Distribution	Madrono. 38(2):139-143, 1991
<i>Carex livida</i>	Evert, E.F., R.D. Dorn, R.L. Hartman, R.W. Lichvar	Distribution	Madrono. 33:313-315, 1986
<i>Carex livida</i>	Lesica, P.	Pine Butte Fen, Teton Co., MT.	Great Basin Naturalist 46:22-32, 1986
<i>Carex paupercula</i>	Cranston, D.M., D.H. Valentine	Transplant Experiments	Biological Conservation 26:175-191
<i>Carex paupercula</i>	Fearn, C.J.I.G.M.	Genetics	Watsonia 11(3):254, 1977
<i>Carex paupercula</i>	Fernald, M.L.	Taxonomy	Rhodora. 8:73-77, 1906
<i>Castilleja chlorita</i>	Holmgren, N.H.	Distribution, Taxonomy	Torrey Botanical Club. 100(2):83-93, 1973
<i>Chrysoanthemum tetrandrum</i>	Bohn, B.A., William Collins, F. & R. Rose	Flavonoids...	Phytochemistry 16:1205-1209
<i>Chrysoanthemum tetrandrum</i>	Leck, M.A.	Germination	Arctic and Alpine Research 12(3):343-349
<i>Chrysanthemum parryi</i> var. <i>montanum</i>	Anderson, Loran C.	Distribution, Taxonomy	Physologia. 38(4):309-320
<i>Chrysanthemum parryi</i> var. <i>montanum</i>	Anderson, Loran C.	Distribution, Taxonomy	USDA, Ogden, UT. 1986
<i>Cicuta bulbifera</i>	Berenbaum, M.	Taxonomy	Ecology. 62(5):1254-1266, 1981
<i>Clarkia rhomboidea</i>	Holmfinger, K.E.	Nomenclature status	Taxon 34(4):707-708, 1985
<i>Claytonia lanceolata</i> var. <i>flava</i>	Davis, R.J.	Distribution, Taxonomy	Brittonia. 18:285-303, 1966
<i>Callamnia debilis</i> var. <i>campanum</i>	Chuang, T., W.C. Heleth, D.H. Wilken	Taxonomy	Am. Journal of Botany. 65(4):450-458, 1978
<i>Callamnia debilis</i> var. <i>campanum</i>	Hitchcock, C.L., J.W. Thompson	Distribution	Lfts. of Western Botany. 4(8):197-206, 1945
<i>Callamnia renata</i>	Joyal, E.	New species report	Brittonia (38):243-248, 1986
<i>Cornus nuttallii</i>	Atkinson, R.G.	Biology	Can. Journal of Botany. 43:1471-1475, 1965
<i>Cornus nuttallii</i>	Funk, A., A.K. Parker	Biology	Can. Journal of Botany. 50:1623-1625, 1972
<i>Cornus nuttallii</i>	Guppy, G.A.	Distribution	Davidsonia. 8(2):34-30, 1977
<i>Cornus nuttallii</i>	Halpern, C.B.	Community ecology	Ecology. 70(3):704-720, 1989
<i>Cymopterus densiflorus</i>	Hartman, R.L.	Taxonomy	Brittonia. 37(1):102-105, 1985
<i>Cymopterus douglasii</i>	Hartman, R.L., L. Constance	Distribution, Taxonomy	Brittonia. 37:88-95, 1985
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Arndt, J., J.D. Michaud, P.L. Healey	Morphometry of Orchid Seeds	Am. Journal of Botany. 66(10):1128-1137, 1979
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Fernald, M.L.	Distribution	Rhodora. 48(565):4, 1946
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Hama, V.L.	Distribution	Rhodora. 75(803):491, 1973
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Hama, V.L.	New record	Rhodora 75:491, 1973

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Taxon	Author	Subject	Publication, Date
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Lesica, P.	Pine Butte Fen, Teton Co., MT.	Great Basin Naturalist 46:22-32, 1986
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Linden, B.	Aseptic germination	Ann. Bot. Fennici 17:174-182
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	Nekola, J.C.	Rare plant notes, R.V. Drexler herbarium	Journal Iowa Academy of Sciences 97:55-73, 1990
<i>Cypripedium fasciculatum</i>	Brownell, V.R.	Distribution, Taxonomy	Lindleyana 2(1):53-57, 1987
<i>Cypripedium fasciculatum</i>	Brownell, V.R., P.M. Catling	Distribution and Taxonomy	LINDLEYANA 2:53-57, 1987
<i>Cypripedium fasciculatum</i>	Brownell, V.R., P.M. Catling	MT	LINDLEYANA 2:53-57, 1987
<i>Cypripedium fasciculatum</i>	Fowlie, J.A.	Community ecology, Distribution	The Orchid Digest, 52(3):137-139, 1988
<i>Cypripedium passerinum</i>	Arditt, J., J.D. Michaud, P.L. Hesley	Morphometry of Orchid Seeds	Am. Journal of Botany. 66(10):1128-1137, 1979
<i>Cypripedium passerinum</i>	Catling, P.M.	Autogamy	Naturaliste Canada 110:37-53, 1983
<i>Cypripedium passerinum</i>	Keddy, C228C.J., P.A. Keddy, R.J. Planc	Ecological study	Can. Field Naturalist 97(3):268-274, 1983
<i>Cypripedium passerinum</i>	Linden, B.	Aseptic germination	Ann. Bot. Fennici 17:174-182
<i>Dactyloctenium aegyptium</i>	Johnston, I.M.	Taxonomy	Journal of the Arnold Arboretum. 29:227-241, 1948
<i>Dimeris aspera</i>	Barneby, R.C.	Distribution	Leaflets of Western Botany. 5(4):61-66, 1947
<i>Douglasii douglasii</i>	Henderson, D.M.	Taxonomy	Brittonia, 33(1):52-56, 1981
<i>Draba apiculata</i>	Hitchcock, C.L.	Distribution, Taxonomy	UoW Press, 1941
<i>Draba fladincensis</i>	Bridgland, F., J.M. Gillet	Distribution	Can. Field-Naturalist. 97(3):279-292, 1983
<i>Draba fladincensis</i>	Hitchcock, C.L.	Distribution, Taxonomy	UoW Press, 1941
<i>Draba incerta</i>	Chambers, J.C., J.A. MacMahon, R.W. Brown	Biology	Ecology. 71(4):1323-1341, 1990
<i>Draba incerta</i>	Hitchcock, C.L.	Distribution, Taxonomy	UoW Press, 1941
<i>Dryopteris cristata</i>	Carlson, T.M., W.H. Wagner Jr.	Distribution	U of M Herbarium. 15:141-162, 1982
<i>Dryopteris cristata</i>	Britton, D.M.	The Spores—	Canadian Journal of Botany 50:2027-2029
<i>Dryopteris cristata</i>	Carlson, T.M., W.H. Wagner	Distribution	Contr. Univ. Mich. Herb. 15:141-162, 1982
<i>Dryopteris cristata</i>	Cody, W.J., D.M. Britton	Phytogeography	Can. Field Naturalist 99(1):101-102
<i>Dryopteris cristata</i>	Cody, W.J., D.M. Britton	Phytogeography	Can. Field Naturalist 99(1):101-102
<i>Eatonella nivea</i>	Barneby, R.C.	Distribution	Leaflets of Western Botany. 5(4):61-66, 1947
<i>Epipactis gigantea</i>	Allen, Don R.	Distribution	Am. Orchid Society Bulletin. 51(10):1038-1040
<i>Epipactis gigantea</i>	Arditt, F., J.D. Michaud, A.P. Oliva	Biology	Botanical Gazette. 142(4):442-453, 1981
<i>Epipactis gigantea</i>	Arditt, F., J.D. Michaud, A.P. Oliva	Biology	Am. Orchid Society Bulletin. 51(2):162-171, 1982
<i>Epipactis gigantea</i>	Bruton, D.F.	Biology, Distribution	Can. Field-Naturalist. 100(3):414-417, 1986
<i>Epipactis gigantea</i>	Burns-Balogh, P., D.L. Szlachetko, A. Dufni	Evolution, Pollination, and Systematics	Pl. Syst. Evol. 156:91-115
<i>Epipactis gigantea</i>	Coleman, R.A.	Distribution	Orchid Digest. 50(2):66-68, 1986
<i>Epipactis gigantea</i>	Coleman, R.A.	Distribution	Orchid Digest. 51(4):203-204, 1987
<i>Epipactis gigantea</i>	Vanderhorst, J.P.	Genetics	Cytologia 40:613-621, 1975
<i>Epipactis gigantea</i>	Burns-Balogh, P., D.L. Szlachetko, A. Dufni	Biology, Taxonomy	Plant Systematics and Evolution. 156:91-115, 1987
<i>Epipactis gigantea</i>	Nelson, G.L., W.A. Weber	MT	Madrono 30:245-249, 1983
<i>Erigeron lachneoides</i>	Nelson, G.L., W.A. Weber	New species	Madrono 30:245-249, 1983
<i>Erigeron lachneoides</i>	Lesica, P.	Pine Butte Fen, Teton Co., MT.	Great Basin Naturalist 46:22-32, 1986
<i>Erigeron viridicarinatus</i>	Ilits, H.H.	Transfers and phytogeography	Sida 2:129-153, 1965
<i>Gentiana glauca</i>	Ilits, H.H.	Transfers and phytogeography	Sida 2:129-153, 1965
<i>Gentiana prostrata</i>	Ilits, H.H.	Transfers and phytogeography	Sida 2:129-153, 1965
<i>Gentiana simplex</i>	Barneby, R.C.	Distribution	Leaflets of Western Botany. 5(4):61-66, 1947
<i>Glycyphora marginata</i>	Alexander, C., G. Hadley	Mycorrhizal effects	New Phytologist 97:39-400, 1984
<i>Goodyera repens</i>	Barclay-Estrup, P., P. Durall, T.E. & A.G. Harris	Flowering sequence of the genus Goodyera...	Rhodora 93(874):141-147, 1991
<i>Goodyera repens</i>	Catling, P.M.	Autogamy	Naturaliste Canada 110:37-53, 1983
<i>Goodyera repens</i>	Phillips, C360H.W.	Noteworthy collection	Madrono 36:174, 1989
<i>Goodyera repens</i>	Vil, S.P., O.C. Ogata	Genetics	Cytologia 40:613-621, 1975
<i>Goodyera repens</i>	Carr, R.L.	Taxonomy	Madrono. 22:390-392, 1974
<i>Goodyera repens</i>	Henderson, L.F.	Distribution, Taxonomy	Torrey Botanical Club. 27:342-359, 1900

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Taxon	Author	Subject	Publication, Date
<i>Haploppappus oherans</i>	Hall, H.M.	Phylogenetic study of Genus	Carnegie Institution of Wash. pub. #389, 1928
<i>Haploppappus insecticurtis</i>	Henderson, L.F.	Distribution, Taxonomy	Torrey Botanical Club. 27:342-359, 1900
<i>Haploppappus insecticurtis</i>	Anderson, Lorán C.	Taxonomy	Am. Journal of Botany. 61(6):665-671, 1974
<i>Haploppappus lauriformis</i>	Anderson, Lorán C.	Taxonomy	Am. Journal of Botany. 61(6):665-671, 1974
<i>Haploppappus macranemo</i> var. <i>macranemo</i>	Hall, H.M.	Phylogenetic study of Genus	Carnegie Institution of Wash. pub. #389, 1928
<i>Haploppappus pygmaeus</i>	Hall, H.M.	Phylogenetic study of Genus	Carnegie Institution of Wash. pub. #389, 1928
<i>Haploppappus radialis</i>	Anderson, Lorán C.	Taxonomy	Am. Journal of Botany. 61(6):665-671, 1974
<i>Howellia aquatilis</i>	Lozica, P.	MT	Ecological applications 3(4):411-421, 1992
<i>Howellia aquatilis</i>	Lozica, P., R.F. Leary, F.W. Allendorf, D.E. Bilderback	MT	Conservation Biology 2:275-282, 1988
<i>Howellia aquatilis</i>	McCune, B.	MT	Madrono 29:123-124, 1982
<i>Kobresia simplicicaulis</i>	Arnold, S.M.	Biology	New Phytologia. 72:583-593, 1973
<i>Kobresia simplicicaulis</i>	Bridgland, F., J.M. Gillet	Distribution	Can. Field-Naturalist. 97(3):279-292, 1983
<i>Kobresia simplicicaulis</i>	Cooper, D.J.	Community ecology, Distribution	Madrono. 38(2):139-143, 1991
<i>Kobresia simplicicaulis</i>	Cronson, D.M., D.H. Valentine	Biology, Mgmt. techniques	Biological Conservation. 26(2):175-191, 1983
<i>Lepidium papilliferum</i>	Henderson, L.F.	Distribution, Taxonomy	Torrey Botanical Club. 27:342-359, 1900
<i>Lepidocystis pungens</i> ssp. <i>hazeliae</i>	Meinke, R.	BM ; ID	Madrono 35(2):105-111, 1988
<i>Levitia kelloggii</i>	Hitchcock, C.L., J.W. Thompson	Distribution	Lfita. of Western Botany. 4(8):197-206, 1945
<i>Lomatium erythroracarpum</i>	Meinke, R., L. Constance	New species report	1984, Torreyia 11: 222-226
<i>Lomatium geyeri</i>	Schlesman, CS10M.A.	Systematics	Syst. Bot. Mono. 4:1-55, 1984
<i>Lycopodium inundatum</i>	Andreas, B., G.E. Host	Community ecology	Ohio Journal of Science. 83(5):246-253, 1983
<i>Lycopodium inundatum</i>	Bowles, M.L., M.M. DeMauro, N. Pavlovic, R.D. Hiebert	Community ecology, Management techniques	Natural Areas Journal. 10(4):187-200, 1990
<i>Lycopodium inundatum</i>	Gillespie, J.P.	Taxonomy	Am. Fern Journal. 52:19-26, 1962
<i>Lycopodium stachense</i>	Beitel, J.M.	Taxonomy	The Michigan Botanist. 18(1):3-13, 1979
<i>Malanthemum dilatatum</i>	Chambers, K.L.	Distribution	Madrono. 22(3):105-114, 1973
<i>Mentzelia mollis</i>	Glad, J.B.	Taxonomy	Madrono. 23(5):283-292, 1976
<i>Mentzelia poкарdiae</i>	Glad, J.B.	Taxonomy	Madrono 23:283-292, 1976
<i>Mentzelia torreyi</i> var. <i>acerosa</i>	Barneby, R.C.	Distribution	Leaflets of Western Botany. 5(4):61-66, 1947
<i>Mertensia bella</i>	Williams, L.O.	Monograph	Annals of Miss. Botanical Garden 14:17-159, 1937
<i>Mimulus clavicola</i>	Greenleaf, J.	Distribution, Taxonomy	Erythea. 7(1):115-120, 1989
<i>Mimulus hymenophyllus</i>	Meinke, R.	OBM	1983
<i>Mimulus primuloides</i>	Douglas, D.A.	Reproduction	Journal of Ecology 69:295-310, 1981
<i>Mimulus ringens</i>	Cooperider, T.S.	Distribution	Ohio Journal of Science. 78:15, 1978
<i>Mimulus washingtonensis</i> ssp. <i>omphalus</i>	Argus, C.L.	Taxonomy	Can. Journal of Botany. 64(3):1331-1337, 1986
<i>Mimulus macfarlanei</i>	Constance, L., R. Rollins	Taxonomy	Bio. Society of WA. 49:147-150, 1936
<i>Mimulus rigidus</i>	Barneby, R.C.	Distribution	Leaflets of Western Botany. 5(4):61-66, 1947
<i>Oxytheca dendroidea</i>	Erter, B.	Distribution, Taxonomy	Brittonia. 32(1):70-102, 1980
<i>Oxytheca dendroidea</i>	Erter, B.	Taxonomy	Brittonia. 33(1):37-38, 1981
<i>Oxytheca dendroidea</i>	Henderson, L.F.	Distribution, Taxonomy	Torrey Botanical Club. 27:342-359, 1900
<i>Pacelia inconspicua</i>	Henderson, D.M., S. Brunsfeld, P. Brunsfeld	Distribution	Madrono. 28(2):88-90, 1981
<i>Papaver khawense</i>	Arn, G.	Community ecology	Cactus Succulent Journal. 44(3):108-110, 1972
<i>Pellaea simpsonii</i> var. <i>robustior</i>	Arn, G.	Taxonomy	Cactus Succulent Journal. 42(1):40-43, 1970
<i>Pellaea simpsonii</i> var. <i>robustior</i>	Arn, G.	Distribution, Taxonomy	Great Basin Naturalist. 48(4):495-498, 1988
<i>Penstemon idahoensis</i>	Alwood, D., S.L. Welsh	Distribution, Taxonomy	Brittonia. 31(2):217-242, 1979
<i>Penstemon jordanii</i>	Holmgren, N.H.	Distribution, Taxonomy	USDA, Ogden, UT, 1975
<i>Penstemon montanum</i>	Blaum, A.C., A.P. Plummer, E.D. McArthur, R. Stevens, B.C. Gupta	Biology, Distribution	Leaflets of Western Botany. 5(4):61-66, 1947
<i>Pennisetum thymifolium</i>	Barneby, R.C.	Distribution	Madrono. 25:172-174, 1978
<i>Phacelia latifolia</i>	Henderson, D.M.	Distribution	Torrey Botanical Club. 27:342-359, 1900
<i>Phacelia minima</i>	Henderson, L.F.	Distribution, Taxonomy	Can. Journal of Botany. 13(5):995-1010, 1983
<i>Phacelia glauca</i>	Corn, I.G.W.	Community ecology	

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Taxon	Author	Subject	Publication, Date
<i>Polypodium glycyrrhiza</i>	Berch, S.M.	Community ecology	Can. Journal of Botany, 66(10):1924-1928, 1988
<i>Patanogenon obtusifolius</i>	Avalle, R., M. Salin	Enrichment of Copper, Zinc, Manganese, and Iron, etc.	Bull. Environ. Contam. Toxicol. 39:320-325, 1982
<i>Patanogenon obtusifolius</i>	Drnell, K.	Plant succession	Journal of Applied Ecology 14:933-947, 1977
<i>Patanogenon obtusifolius</i>	Tjip, E.	Ecology	Hydrobiologia 153:203-216, 1987
<i>Patanogenon obtusifolius</i>	Toivonen, H., C. Nybom	Succession	Ann. Bot. Fennici 26:1-14, 1989
<i>Patanogenon obtusifolius</i>	Toivonen, H., S. Back	Eutrophication caused changes	Ann. Bot. Fennici 26:27-38, 1989
<i>Prunella alcinella</i>	Cholewa A.F., D.M. Henderson	Distribution, Taxonomy	Brittonia, 36(1):59-62, 1984
<i>Ranunculus gelatus</i>	Benson, L.	Taxonomy	Am. Midland Naturalist, 40(1): 1-261, 1948
<i>Ranunculus pygmaeus</i>	Benson, L.	Taxonomy	Am. Midland Naturalist, 40(1): 1-261, 1948
<i>Rhynchospora alba</i>	Cody, W.J.	Distribution	Can. Field-Naturalist, 92(2):137-143, 1978
<i>Ribes wolffii</i>	Anderson, R. Scott, David S. Shafer	Community ecology	Madrono, 38(4):287-295, 1991
<i>Ribes wolffii</i>	Dye, A.J., W.H. Moir	Community ecology	Am. Midland Naturalist, 97(1):133-146, 1977
<i>Rubus pubescens</i>	Cornu, I.O.W.	Community ecology	Can. Journal of Botany, 13(5):995-1010, 1983
<i>Salix candida</i>	Argus, G.W.	Taxonomy	U of WY Publications, 21(1):1-63, 1957
<i>Salix candida</i>	Boga, K., P. Hansen, R. Pfister, J. Joy	Community ecology	U of MT, 1990
<i>Salix candida</i>	Cooper, D.J.	Community ecology, Distribution	Madrono, 38(2):139-143, 1991
<i>Salix candida</i>	Hansen, P., K. Boga, R. Pfister, J. Joy	Community ecology	U of MT, Missoula, MT, 1990
<i>Salix candida</i>	Johnson, F.D., S.J. Brunafeld	Distribution	Madrono, 30:259, 1983
<i>Salix farriac</i>	Argus, G.W.	Taxonomy	U of WY Publications, 21(1):1-63, 1957
<i>Salix farriac</i>	Dorn, R.D.	Taxonomy	Can. Journal of Botany, 53(5):1491-1522, 1975
<i>Salix farriac</i>	Hansen, P.J., S.W. Chadde, R.D. Pfister	Community ecology, Distribution, Mgmt. techniques	U of M. Publ. 49, Missoula, MT, 1988
<i>Salix farriac</i>	Hitchcock, C.L., J.W. Thompson	Distribution	Litt. of Western Botany, 4(6):197-206, 1945
<i>Salix glauca</i>	Argus, G.W.	Taxonomy	Gray Herbarium #196, 1965
<i>Saxifraga cernua</i>	Bridgland, F., J.M. Gillet	Distribution	Can. Field-Naturalist, 97(3):279-292, 1983
<i>Saxifraga tempestiva</i>	Elvander, P.E.	Taxonomy	Systematic Botany Monographs 3:1-44, 1984
<i>Saxifraga tempestiva</i>	Elvander, P.E., M.F. Denton	New Species report	Madrono 23:346-354, 1976
<i>Schreuchzeria palustris</i>	Cody, W.J.	Distribution	Can. Field-Naturalist, 89:69-71
<i>Scirpus subterminalis</i>	Beer, S., R.O. Wesel	Biology	Plant Physiology, 70(2):488-492, 1982
<i>Scirpus subterminalis</i>	Broodberg, R., T.R. Fisher	Distribution	Ohio Journal of Science, 76(3):109-110, 1976
<i>Scirpus subterminalis</i>	Cutler, P.M., B. Freedman, C. Stewart, J.J. Kerekes, L.P. Letkovich	Community ecology, Distribution	Can. Journal of Botany, 64(4):724-725, 1986
<i>Scirpus subterminalis</i>	Hough, R.A.	Biology	Limnology & Oceanography, 19(6):912-927, 1974
<i>Sedum rapunculoides</i>	Chasen, R.T.	Distribution, Taxonomy	Cornell U. press, 1975
<i>Salix glauca</i>	Bjorkman, O., M. Nobe, H. Mooney	Biology	Carnegie Inst. 73:748-757, 1974
<i>Stachys nemoralis pennsylvanica</i>	Holmgren, A.H., L.M. Shultz, T.K. Lowrey	Taxonomy	Brittonia, 28(2):255-262, 1976
<i>Stephanomeria mathesonensis</i>	Gottlieb, L.	BR, Ham	Kalmiopsis, 1991, NPS
<i>Stipa viridula</i>	Anderson, Howard G., Arthur W. Bailey	Community ecology	Can. Journal of Botany, 58(8):985-996
<i>Stipa viridula</i>	Barkworth, M.E., J. Maze	Taxonomy	Taxon, 31(2):290-299, 1982
<i>Stipa viridula</i>	Fulbright, T.E., E.F. Redente, A.M. Wilson	Biology	Journal of Range Mgmt. 36(3):390-394, 1985
<i>Stipa viridula</i>	Fulbright, T.E., E.F. Redente, A.M. Wilson	Biology	Journal of Range Mgmt. 37(5):462-464, 1984
<i>Stipa viridula</i>	Fulbright, T.E., E.F. Redente, A.M. Wilson	Biology	Journal of Range Mgmt. 38(3):266-270, 1985
<i>Streptopus streptopoides var. brevipes</i>	Fasset, N.C.	Taxonomy	Rhodora, 37:88-113, 1935
<i>Tellina grandiflora</i>	Chambers, K.L.	Distribution	Madrono, 22(3):105-114, 1973
<i>Thelypodium repandum</i>	Alverson, Ed.	Taxonomy	Douglasia, 9(3):2-4
<i>Thelypodium phlegmaria</i>	McLaughlin, W.T.	Flora of Glacier NP	Rhodora 37:362-365, 1935
<i>Toxifolia glutinosa ssp. abnana</i>	Hitchcock, C.L.	Taxonomy	Am. Midland Naturalist, 31:487-498, 1944
<i>Toxifolia glutinosa ssp. brevicaule</i>	Hitchcock, C.L.	Taxonomy	Am. Midland Naturalist, 31:487-498, 1944
<i>Tridentella latifolia</i>	Anderson, R.C., O.L. Loucks	Biology, Distribution	Ecology, 54(4):798-808, 1973
<i>Tridentella latifolia</i>	Berch, S.M.	Community ecology	Can. Journal of Botany, 66(10):1924-1928, 1988

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Taxon	Author	Subject	Publication, Date
<i>Trientalis latifolia</i>	Chambers, K.L.	Distribution	Madrono. 22(3):105-114, 1973
<i>Trientalis latifolia</i>	Halpern, C.B.	Community ecology	Ecology. 70(3):704-720, 1989
<i>Trifolium asyriacense</i>	Gillkey, H.M.	Distribution, Taxonomy	Madrono. 13:167-169, 1956
<i>Trifolium asyriacense</i>	Grimes, J.W.	Community ecology, Distribution	Madrono. 31(2):80-85, 1984
<i>Trifolium plumatum</i> var. <i>amplexifolium</i>	Gilllett, J.M.	Taxonomy	Can. Journal of Botany. 50(10):1975-2007, 1972
<i>Vaccinium oxycoccos</i>	Angelo, R.	Distribution	Rhodora. 81(826):285-286, 1988
<i>Vaccinium oxycoccos</i>	Ballard, N.	Community ecology	Arboretum Bulletin. 39(2):32, 1976
<i>Viola renifolia</i>	Canne, J.M.	Genetics	Can. Journal of Botany 65(4):653-655, 1987
<i>Viola renifolia</i>	Nekola, J.C.	Rare plant notes, R.V. Drexler herbarium	Journal Iowa Academy of Sciences 97:55-73, 1990

## APPENDIX 3

### Rare Habitat Group Analysis

## Appendix 3

### Introduction

The combining of sensitive species into habitat groups was accomplished to provide a habitat based analysis of plant communities that harbor rare plants that was both sufficient to foster protection and doable within the time and resource constraints of the project. In each section below, a list of species by major habitat group is provided with GIS attributes and themes. This information is given to facilitate planning efforts for future ecosystem management projects. Each section is prefaced with a short description of the important general physical attributes of each habitat group and a short discussion of the impacts of current and historic land use practices. In each case, the generalities have been stressed. We recognize that there is and always will be variation within the Basin with respect to the intensity and nature of the threats.

### ALPINE

For this analysis, alpine includes true alpine and high subalpine habitats. These areas within the Interior Columbia Basin (ICB) are limited in extent though not infrequent. Our alpine areas are diverse in structure and composition. The more severe alpine areas include barren rocky outcrops, shallow residuum, and talus slopes. Areas with park-like subalpine fir and whitebark pine forests and forb meadows are significantly less arduous. The pattern and quantity of vegetation at high elevations is largely determined by snowpack, wind, and exposure. The economic uses of alpine areas in the ICB are essentially limited to sheep grazing and mining, though recreation-based commerce (e.g., outfitters and guides) is locally important. The most common human use of high elevation areas is recreational activities such as hiking and hunting. Alpine areas are very important to wildlife, especially as sites for reproduction and raising offspring (e.g., mountain goats and nutcrackers). The floristic diversity of high elevation habitats vary from low in harsh sites to high in moist meadows. Alpine areas contribute significantly to the beta-diversity (between site diversity) of local ecosystems because high portions of the species there are endemic to some degree.

Historically, alpine areas throughout the ICB were heavily used by domestic sheep. This use has declined significantly in the past 50 years though scars created between 1880 and 1930 are still readably evident. Today's sheep operations are smaller and better managed. Mining (usually gold or heavy metals such as antimony or uranium) at high elevations is generally devastating on a local scale (discounting the associated heavy road construction through subtending forest) but is scattered and infrequent. The pace of mineral exploration and extraction is highly dependent on the market price of the ore being sought. Beginning around 1920, white pine blister rust began infecting and devastating whitebark pine stands throughout the ICB. Today, this pathogen is still impacting high elevation woodlands. Exotic plant species (mostly grasses) are well represented in high elevation habitats though these areas are rarely as severely altered as low

elevation vegetation types. In many cases, exotic plants were purposely introduced either for or by sheep grazers to improve forage production. The recreational use of alpine habitats is usually of little to no consequence; however, popular and frequently uses areas (e.g., the northern Cascades of Washington and the Trinity Lakes region of central Idaho) can suffer greatly from trampling, compaction, and increased rill erosion.

#### Idaho North

Subgroup: Alpine

Themes and/or Attributes: CRB005, CRB006, SAF206, SAF208

##### Species

*Arnica alpina tomentosa*  
*Artemisia campestris borealis purshii*  
*Carex brewerii paddoensis*  
*Carex incurviformis incurviformis*  
*Carex stramineiformis*  
*Diaphasiastrum sitchense*  
*Draba apiculata*  
*Draba fladnizensis*

*Draba incerta*  
*Erigeron radicans*  
*Phacelia lyallii*  
*Ranunculus gelidus*  
*Ranunculus pygmaeus*  
*Saxifraga cernua*  
*Silene uralensis montana*  
*Thamnia vermicularis*

#### Oregon, Blue Mountains

Subgroup: Alpine barrens

Themes and/or Attributes: CRB005, CRB006

##### Species

*Allium campanulatum*  
*Anemone multifida tetonensis*  
*Antennaria aromatica*  
*Arenaria rossii rossii*  
*Asplenium trichomanes*  
*Astragalus robbinsii alpiniformis*  
*Bupleurum americanum*  
*Carex nardina*  
*Castilleja rubida*  
*Cymopterus nivalis*  
*Draba lemmonii cyclomorpha*  
*Dryas drummondii*  
*Epilobium latifolium*  
*Eriogonum scopulorum*  
*Eritrichium nanum*

*Geum rossii turbinatum*  
*Hulsea algida*  
*Lesquerella kingii diversifolia*  
*Lomatium cusickii*  
*Lomatium erythrocarpum*  
*Lomatium greenmanii*  
*Penstemon spatulatus*  
*Poa suksdorfii*  
*Polemonium viscosum*  
*Polystichum kruckebergii*  
*Ranunculus verecundus*  
*Salix wolfii*  
*Selaginella watsonii*  
*Townsendia montana*  
*Townsendia parryi*

Subgroup: Snow Banks

Themes and/or Attributes: CRB005, CRB006

##### Species

*Thalictrum alpinum hebetum*

*Trollius laxus albiflorus*

Subgroup: Alpine Herbaceous  
Themes and/or Attributes: CRB005

Species

*Agrostis humilis*  
*Arenaria rossii* rossii  
*Astragalus robbinsii* alpiniformis  
*Bupleurum americanum*  
*Carex nardina*  
*Carex nova*  
*Carex praeceptorum*  
*Castilleja glandulifera*  
*Epilobium latifolium*

*Hackelia patens* patens  
*Lomatium greenmanii*  
*Penstemon spatulatus*  
*Polemonium viscosum*  
*Saxifraga adscendens* oregonensis  
*Senecio dimorphophyllus*  
*Senecio porteri*  
*Thalictrum alpinum* hebetum

Subgroup: Alpine wetlands  
Themes and/or Attributes: CRB005, CRB007

Species

*Carex nova*  
*Corydalis caseana* cusickii  
*Epilobium latifolium*  
*Kobresia bellardii*  
*Kobresia simpliciuscula*  
*Platanthera obtusata*

*Salix brachycarpa*  
*Salix drummondiana*  
*Salix farriac*  
*Thalictrum alpinum* hebetum  
*Trollius laxus* albiflorus

## Oregon, Basin and Range

Subgroup: Alpine  
Themes and/or Attributes: CRB005, CRB006, SAF206, SAF208, Steens Mountain

Species

*Agrostis humilis*  
*Botrychium lanceolatum*  
*Botrychium lunaria*  
*Botrychium minganense*  
*Botrychium pinnatum*  
*Carex haydeniana*  
*Carex nova*  
*Carex praeceptorum*  
*Castilleja pilosa* howellii  
*Claytonia nevadensis*

*Claytonia megarhiza*  
*Cryptantha humilis*  
*Gentiana prostrata*  
*Gentiana simplex*  
*Gentianella tenella* tenella  
*Kobresia bellardii*  
*Salix brachycarpa*  
*Salix orestera*  
*Salix wolfii*

## Oregon, East Cascades South

Subgroup: Alpine Barrens and Fell Fields  
Themes and /or Attribute: CRB005, CRB006

Species

*Arabis suffrutescens* horizontalis

*Arnica viscosa*

*Botrychium pumicola*  
*Castilleja rupicola*  
*Collomia larsenii*  
*Elmera racemosa puberulenta*  
*Epilobium latifolium*  
*Hieracium bolanderi*

*Ivesia shockleyi*  
*Poa suksdorfii*  
*Polystichum kruckebergii*  
*Silene suksdorfii*  
*Smelowskia ovalis ovalis*

#### Washington, Columbia Basin

Subgroup: Alpine  
 Themes and/or Attributes: CRB005

Species  
*Pellaea breweri*

*Spiraea densiflores splendens*

#### Washington, East Cascades North

Subgroup: Alpine  
 Themes and/or Attributes: CRB005, CRBS10, SAF206

Species  
*Agoseris elata*  
*Agrostis borealis*  
*Anemone nuttalliana*  
*Arabis lemmonii paddoensis*  
*Arnica nevadensis*  
*Arnica rydbergii*  
*Aster glaucescens*  
*Botrychium lunaria*  
*Botrychium pinnatum*  
*Carex atrata atrosquama*  
*Carex atrata erecta*  
*Carex norvegica*  
*Carex proposita*  
*Carex scirpoidea scirpoidea*  
*Carex vallicola*  
*Castilleja suksdorfii*  
*Claytonia megarhiza nivalis*  
*Douglasia nivalis dentata*  
*Draba aurea*  
*Draba cana*  
*Erigeron humilis*  
*Erigeron leibergii*  
*Erigeron salishii*  
*Eriophorum viridicarinatum*

*Eritrichium nanum elongatum*  
*Gentiana glauca*  
*Gentianella tenella*  
*Geum rivale*  
*Geum rossii depressum*  
*Lloydia serotina*  
*Loiseleuria procumbens*  
*Parnassia kotzebuei kotzebuei*  
*Pedicularis rainierensis*  
*Penstemon washingtonensis*  
*Polemonium viscosum*  
*Potentilla diversifolia perdissecta*  
*Potentilla quinquefolia*  
*Ranunculus pygmaeus*  
*Salix tweedyi*  
*Salix vestita erecta*  
*Saxifraga apetalata*  
*Saxifraga cernua*  
*Saxifraga debilis*  
*Spiranthes porrifolia*  
*Poa arctica arctica*  
*Poa paniculata*  
*Swertia perennia*  
*Zigadenus elegans*

## Washington, Okanogan Highlands

Subgroup: Barrens, tundra, snowbanks

Themes and/or Attributes: CRB005, CRB006

### Species

*Agrostis borealis*

*Antennaria corymbosa*

*Dodecatheon pulchellum watsonii*

*Draba aurea*

*Draba cana*

*Erigeron humilis*

*Eriophorum viridicarinatum*

*Gentiana glauca*

*Gentianella tenella*

*Poa arctica arctica*

*Polemonium viscosum*

*Potentilla nivea*

*Potentilla quinquefolia*

*Potentilla diversifolia perdissecta*

*Saxifraga adscendens oregonensi*

*Saxifraga cernua*

*Saxifraga debilis*

Subgroup: Subalpine

Themes and/or Attributes: CRB005, SAF206

### Species

*Botrychium lunaria*

*Botrychium minganense*

*Botrychium pinnatum*

*Botrychium simplex*

*Carex atrata atosquama*

*Carex atrata erecta*

*Carex paupercula*

*Carex scopulorum prinophylla*

*Dodecatheon pulchellum*

*Draba aurea*

*Draba cana*

*Gentiana glauca*

*Gentianella tenella*

*Parnassia kotzebuei kotzebuei*

*Salix tweedyi*

*Saxifraga integrifolia apetal*

*Spiranthes porrifolia*

*Trimorpha elata*

## Utah

Subgroup: Alpine

Themes and/or Attributes: CRB005, CRB006

### Species

*Draba incerta*

*Draba douglasii*

*Erigeron nanus*

## Wyoming

Subgroup: Alpine meadows

Themes and/or Attributes: CRB005

### Species

*Antennaria monocephala*

*Parrya nudicaulis*

*Pedicularis pulchella*

*Sausaura weberi*

Subgroup: Alpine semibarrens

Themes and/or Attributes: CRB005, CRB006

Species

*Minuartia macranthera*

*Townsendia leptotes*

Subgroup: Alpine rock outcrops and boulder fields

Themes and/or Attributes: CRB005, CRB006

Species

*Draba crassa*

*Draba globosa*

## AQUATIC AND RIPARIAN

Aquatic and Riparian areas of the Interior Columbia Basin (ICB) include a broad range of intermittent and ephemeral features, perennial streams of all orders, large and small lakes, human-made water impoundments, and geothermal waters. These water bodies are of critical importance to all forms of life within the ICB. Humans use these resources for recreation, municipal utilities, commerce, and agriculture. Wildlife use them as habitat, breeding and hunting sites, refugia, and most obviously, for drinking. Migratory wildlife from salmon to neotropical birds and waterfowl have suffered irreparable harm and may even be faced with extinction because their water dominated habitats have been significantly altered. Bodies of water are no less important for plants. Vernal pools and ephemeral water courses provide unique sites in which many annuals may dependably complete their life cycles. Lakes, both large and small, provide a spectrum of habitats for plants that require submersion, wave action, low energy water movement, shallow water tables, etc. Open stream courses are the most common water feature in the ICB. The riparian areas and wetlands surrounding streams from the high mountains to the lowest deserts add structural and floristic diversity to the landscape, qualities that benefit plant species, wildlife, and humanity, and are very important in maintaining the overall biological diversity in the ICB. In lowland areas and xeric portions of the analysis area, essentially all of the riparian areas have been heavily and adversely impacted (primarily by domestic livestock grazing) which has lead to documented and significant losses in plant, fish, animal, and arthropod diversity. Other wetlands like peatlands, hot springs, and seeps are generally very small but provide specialized microhabitats and are commonly occupied by unique plants and animals.

Current and historic patterns of water use within the ICB pose many threats to the health of riparian and aquatic habitats. Sedimentation of streambeds and the accumulation of silts in standing water bodies (both natural and human made) degrade these habitats for many plants, wildlife and people. Domestic livestock grazing has been very destructive to riparian areas, especially in the more arid portions of the ICB where the removal and trampling of vegetation and the degradation of streambanks has reduced many streams that were once perennial and vested with diverse plant and animal communities to open, barren ephemeral gulleys (a condition that benefits no one). Eutrophication from agricultural run-off and untreated or poorly treated sewage from both humans and livestock has and continues to reduce the health and economic value of aquatic and riparian ecosystems throughout the ICB. Water diversions for agriculture,

industry, and direct human consumption has also negatively impacted water dominated plant and animal communities. The introduction of exotic plants and animals have exacted permanent alterations to aquatic and riparian communities throughout the ICB. From brook trout to purple loosestrife and reed canarygrass, exotic species have become both ubiquitous, destructive, and firmly incorporated into our biota.

#### Idaho North

##### Subgroup: Peatlands

Themes and/or Attributes: CRB007; Channel Type 10,12

##### Species

*Andromeda polifolia*  
*Betula pumila gladulifera*  
*Carex buxbaumii*  
*Carex chordorrhiza*  
*Carex comosa*  
*Carex flava*  
*Carex leptalea*  
*Carex livida*  
*Carex paupercula*  
*Cicuta bulbifera*  
*Cypripedium fasciculatum*  
*Drosera intermedia*  
*Dryopteris cristata*

*Eriophorum viridicarinarum*  
*Gaultheria hispidula*  
*Helodium blandowii*  
*Hypericum majus*  
*Ludwigia polycarpa*  
*Lycopodiella inundata*  
*Rhynchospora alba*  
*Salix candida*  
*Salix pedicellaris*  
*Scheuchzeria palustris*  
*Sphagnum mendocinum*  
*Trientalis arctica*  
*Vaccinium oxycoccos*

##### Subgroup: Streamside

Themes and/or Attributes: CRB007, CRBS05, SAF235; Channel Type 12

##### Species

*Agrostis oregonensis*  
*Bryum calobryoides*  
*Chrysosplenium tetrandrum*  
*Collema curtisporum*  
*Epipactis gigantea*

*Lobaria hallii*  
*Ribes howellii*  
*Salix farriac*  
*Tofieldia glutinosa brevistyla*

##### Subgroup: Wet Meadows

Themes and/or Attributes: CRB007; Channel Type 12

##### Species

*Agrostis oregonensis*  
*Allium validum*  
*Haplopappus hirtus sonchifolius*

*Psilocarphus tenellus*  
*Salix farriac*

##### Subgroup: Aquatic

Themes and/or Attributes: CRBS20

##### Species

*Scirpus subterminalis*

## Idaho South

Subgroup: Alkaline Wetlands

Themes and/or Attributes: CRB007, CRBS05; Channel Type 12

### Species

*Astragalus diversifolius*

*Lomatogonium rotatum*

*Cleome plocasperma*

*Primula incana*

*Salicornia rubra*

*Teucrium canadense occidentale*

Subgroup: Bogs

Themes and/or Attributes: CRB007, CRBS05; Channel Type 10, 12

### Species

*Cicuta bulbifera*

*Epilobium palustre*

*Salix candida*

*Picea glauca*

Subgroup: Ephemeral Wetlands

Themes and/or Attributes: CRB007, CRBS05; Channel Type 10, 12

### Species

*Downingia bacigaluppi*

*Machaerocarpus californicus*

*Sphaeromeria potentilloides*

Subgroup: Other Aquatic and Riparian Habitats

Themes and/or Attributes: CRB007, CRBS05, CRBS20, SAF235; Channel Type 12, 20

### Species

*Astragalus leptaleus*

*Bacopa rotundifolia*

*Epipactis gigantea*

*Juncus hallii*

*Limosella acaulis*

*Salix glauca*

*Salix pseudomonticola*

## Montana

Subgroup: Peatlands

Themes and/or Attributes: CRB007; Channel Type 10, 12

### Species

*Carex chordorrhiza*

*Carex crawei*

*Carex livida*

*Carex paupercula*

*Carex tenuiflora*

*Cypripedium calceolus parviflorum*

*Cypripedium passerinum*

*Drosera anglica*

*Drosera linearis*

*Eleocharis rostellata*

*Epipactis gigantea*

*Eriophorum viridicarinarum*

*Gentianopsis simplex*

*Kalmia occidentalis*

*Liparis loeselii*

*Lycopodium inundatum*

*Orchis rotundifolia*

*Scheuchzeria palustris*

*Scirpus cespitosus*

*Scirpus hudsonianus*

*Utricularia intermedia*

*Viola renifolia*

Subgroup: Emergent wetlands

Themes and/or Attributes: CRBS20; Channel Type 12

Species

Carex amplifolia  
Carex chordorrhiza

Carex comosa  
Howellia aquatilis

Subgroup: Aquatic habitats

Themes and/or Attributes: CRBS20

Species

Bidens beckii  
Brasenia schreberi  
Heteranthera dubia  
Lilaea scilloides  
Najas guadalupensis

Nymphaea tetragona  
Potamogeton obtusifolius  
Scirpus subterminalis  
Wolffia columbiana

Subgroup: Riparian habitats

Themes and/or Attributes: CRB007, CRBS20, SAF235; Channel Type 12, 20

Species

Aster frondosus  
Carex crawei  
Carex neurophora  
Carex parryana idaho  
Carex scoparia  
Carex sychnocephala  
Centunculus minimus  
Chrysosplenium tetrandrum  
Cyperus acuminatus  
Cyperus rivularis  
Cypripedium calceolus parviflorum  
Cypripedium passerinum  
Elatine americana  
Elatine californica  
Epipactis gigantea  
Gentianopsis simplex  
Juncus covillei covillei

Mimulus primuloides  
Ophioglossum vulgatum  
Orchis rotundifolia  
Ranunculus orthorhynchus platyphyllus  
Ribes triste  
Rotala ramosior  
Salix wolfii wolfii  
Scirpus pallidus  
Spiraea x pyramidata  
Stellaria crassifolia  
Thalictrum alpinum  
Thelypodium sagittatum sagittatum  
Thelypteris phegopteris  
Trifolium cyathiferum  
Veratrum californicum  
Viola renifolia

Subgroup: Forested wetlands

Themes and/or Attributes: SAF206, SAF210, SAF217, SAF235; Channel Type 12, 20

Species

Carex eburnea  
Carex paupercula  
Cypripedium calceolus parviflorum  
Cypripedium passerinum  
Dryopteris cristata  
Epipactis gigantea  
Halenia deflexa

Kalmia occidentalis  
Orchis rotundifolia  
Petasites frigidus  
Spiraea x pyramidata  
Thelypteris phegopteris  
Viola renifolia

## Oregon Basin and Range and Owyhee Uplands

Subgroup: Alkaline pools, hot springs and adjacent meadows are sites of saline-alkaline affected soils.  
Themes and/or Attributes: CRB007, CRBS05; Channel Type 10, 12

Species	
Hymenoxys lemmonii	Rorippa columbiae
Phacelia inundata	Sesuvium verrucosum
Plagiobothrys salsus	Thelypodium brachycarpum

Subgroup: Vernal Pool Species  
Themes and/or Attributes: CRB007, CRBS05; Channel Type 10, 12

Species	
Bergia texana	Nama lobbia
Downingia insignis	Rotala ramosior
Downingia laeta	Sesuvium verrucosum
Gratiola heterosepala	Thelypodium howellii howellii
Mimulus latidens	

Subgroup: Mud Flat Species  
Themes and/or Attributes: CRB007, CRBS05; Channel Type 10

Species	
Allium madidum	Juncus kelloggii
Juncus bryoides	Juncus tiehmii
Juncus capillaris	Mimulus evanescens
Juncus hemiendytus abjectus	Scribneria bolanderi

Subgroup: Playa Species  
Themes and/or Attributes: CRB007, CRBS05, SRM401; Channel Type 10

Species	
Lepidium davisi	Rorippa columbiae

Subgroup: Riverine communities  
Themes and/or Attributes: SAF235; Stream Order 3, 4

Species	
Carex backii	Pleuropogon oregonus
Carex hystrixia	Populus angustifolia
Carex sheldonii	Rorippa columbiae
Juncus torreyi	Salix drummondiana
Penstemon pratensis	Salix orestera
Perideridia lemmonii	Salix wolfii

Subgroup: Ponds  
Themes and/or Attributes: CRBS20; Channel Type 10, 12

Species

*Elodea nuttallii*  
*Lilaea scilloides*  
*Myriophyllum sibiricum*  
*Potamogeton diversifolius*

*Potamogeton filiformis*  
*Potamogeton foliosus fibrillosus*  
*Rotala ramosior*

#### Oregon, Blue Mountains

Subgroup: Herbaceous and shrub wetlands

Themes and/or Attributes: CRB007, CRBS05; Channel Type 12, 20

##### Species

*Allium madidum*  
*Botrychium ascendens*  
*Botrychium crenulatum*  
*Botrychium lanceolatum*  
*Botrychium minganense*  
*Botrychium montanum*  
*Botrychium paradoxum*  
*Botrychium pinnatum*  
*Calochortus longebarbatus peckii*  
*Calochortus longebarbatus longebarbatus*

*Carex concinna*  
*Carex dioica gynocrates*  
*Carex hystricina*  
*Carex sheldonii*  
*Epipactis gigantea*  
*Phacelia minutissima*  
*Pleuropogon oregonus*  
*Thelepodium howellii spectabilis*  
*Thelepodium howellii howellii*  
*Trifolium douglasii*

Subgroup: High gradient streams

Themes and/or Attributes: CRB007, CRBS05; Channel Type 12; Rosgen Type A, B

##### Species

*Allium robbinsii*  
*Astragalus robbinsii alpiniformis*  
*Bolandra oregana*  
*Carex hendersonii*  
*Clematis columbiana*

*Corydalis caseana cusickii*  
*Dryopteris felix-mas*  
*Lycopodium annotinum*  
*Mimulus patulus*  
*Rubus bartonianus*

Subgroup: Low gradient streams

Themes and/or Attributes: CRB007, CRBS05; Channel Type 12, 20; Rosgen Type C

##### Species

*Allium madidum*  
*Botrychium minganense*  
*Botrychium montanum*  
*Calochortus longebarbatus peckii*  
*Calochortus longebarbatus longebarbatus*  
*Carex backii*  
*Carex concinna*  
*Carex hendersonii*  
*Carex hystricina*

*Carex nova*  
*Carex sheldonii*  
*Corydalis caseana cusickii*  
*Dryopteris felix-mas*  
*Hackelia patens patens*  
*Lycopodium annotinum*  
*Mimulus washingtonensis washingtonensis*  
*Pleuropogon oregonus*  
*Ribes oxycanthoides cognatum*

Subgroup: Open water

Themes and/or Attributes: CRBS20

##### Species

*Myriophyllum sibiricum*

*Potamogeton filiformis*

### Oregon, East Cascades South

Subgroup: Vernal Pools and Receding Shorelines

Themes an/or Attributes:

Species

*Juncus kelloggii*

*Lilaea scilloides*

*Limnanthes floccosa bellingeriana*

*Mimulus evanescens*

*Mimulus tricolor*

*Parvisedum pumilum*

*Phacelia inundata*

*Pilularia americana*

*Rorippa columbiae*

Subgroup: Herbaceous Montane and Subalpine Meadows

Themes an/or Attributes:

Species

*Agoseris elata*

*Botrychium lanceolatum*

*Botrychium minganense*

*Botrychium montanum*

*Botrychium pinnatum*

*Calamagrostis breweri*

*Calochortus longebarbatus longebarbatus*

*Carex buxbaumii*

*Carex comosa*

*Epilobium luteum*

*Gentiana newberryi newberryi*

*Oxypolis occidentalis*

*Perideridia erythrorhiza*

*Perideridia howellii*

Subgroup: Herbaceous Aquatic and Subaquatic Bogs

Themes an/or Attributes:

Species

*Coptis trifolia*

*Cypripedium calceolus parviflorum*

*Lobelia dortmanna*

*Lophotocarpus californicus*

*Myriophyllum sibiricum*

*Potamogeton filiformis*

*Potamogeton foliosus fibrillosus*

*Scheuchzeria palustris americana*

Subgroup: Riparian and Riverine Shrublands

Themes and/or Attributes:

Species

*Artemisia ludoviciana estesii*

*Juncus torreyi*

*Salix bonplandiana*

### Washington, Columbia Basin

Subgroup: Riparian, riverine

Themes and/or Attributes: CRB007, CRBS05; Channel Type 12; Stream Order 2, 3, 4

Species

<i>Astragalus riparius</i>	<i>Hypericum majus</i>
<i>Carex densa</i>	<i>Impatiens aurella</i>
<i>Carex interrupta</i>	<i>Limosella acaulis</i>
<i>Crassula aquatica</i>	<i>Lindernia dubia</i>
<i>Cyperus bipartitus</i>	<i>Spartina pectinata</i>
<i>Heuchera grossulariifolia tenuifolia</i>	

Subgroup: Riparian, temporary pond/seep

Themes and/or Attributes: CRB007, CRBS05; Channel Type 10, 12, 20; Stream Order 1

Species

<i>Damasium caciformicus</i>	<i>Mimulus suksdorfii</i>
<i>Downingia bacigallupii</i>	<i>Spiranthes porrifolia</i>
<i>Eleocharis atropurpurea</i>	<i>Tauschia tenuissima</i>
<i>Isoetes nuttallii</i>	<i>Teucrium canadense viscidum</i>

Subgroup: Riparian, permanent pond/seep

Themes and/or Attributes: CRB007, CRBS05; Channel Type 10, 12, 20; Stream Order 2, 3

Species

<i>Carex comosa</i>	<i>Eleocharis rostellata</i>
<i>Carex flava</i>	<i>Lobelia kalmii</i>
<i>Carex hendersonii</i>	<i>Muhlenbergia glomerata</i>
<i>Carex hystricina</i>	<i>Ophioglossum pusillum</i>
<i>Epipactis gigantea</i>	<i>Utricularia minor</i>

Washington, East Cascades North

Subgroup: Riparian and Aquatic Wetlands

Themes and/or Attributes: CRB007, CRBS05; Channel Type 3, 10, 12, 20

Species

<i>Carex buxbaumii</i>	<i>Epipactis gigantea</i>
<i>Carex chordorrhiza</i>	<i>Eriophorum viridicarinatum</i>
<i>Carex comosa</i>	<i>Eryngium petiolaria</i>
<i>Carex densa</i>	<i>Gentiana douglasiana</i>
<i>Carex hystricina</i>	<i>Gentiana glauca</i>
<i>Carex novegica</i>	<i>Geum glauca</i>
<i>Carex pauperula</i>	<i>Geum rivale</i>
<i>Carex saxatilis major</i>	<i>Juncus kelloggii</i>
<i>Carex sychnocephala</i>	<i>Listera borealis</i>
<i>Carex tenuiflora</i>	<i>Limosella acaulis</i>
<i>Castilleja suksdorfii</i>	<i>Lindernia dubia</i>
<i>Chrysosplenium tetrandrum</i>	<i>Liparis loeselii</i>
<i>Cicuta bulbifera</i>	<i>Loiseluria procumbens</i>
<i>Crassula aquatica</i>	<i>Ophioglossum pusillum</i>
<i>Cypripedium parviflorum</i>	<i>Platanthera chorisiana</i>
<i>Eleocharis atropurpurea</i>	<i>Platanthera sparsiflora</i>
<i>Eleocharis rostellata</i>	<i>Polypodium hesperium</i>

Potentilla breweri  
 Ribes oxycanthoides cognatum  
 Rubus acaulis  
 Salix brachycarpa  
 Salix glauca  
 Salix sessilifolia  
 Salix tweedyi

Salix vestita erecta  
 Sanicula marilandica  
 Spiranthus porrifolia  
 Sisyrinchium septentrionale  
 Teucrium canadense viscidum  
 Trimorpha elata  
 Zigadenus elegans

## Washington, Okanogan Highlands

Subgroup: Xero-riparian

Themes and/or Attributes: CRB007, CRBS05; Channel Type 12; Stream Order 1, 2

### Species

Botrychium lanceolatum  
 Botrychium lunaria  
 Botrychium montanum  
 Botrychium pinnatum  
 Corydalis aurea  
 Epipactis gigantea

Impatiens aurella  
 Listera borealis  
 Lycopodium dendroideum  
 Oxytropis campestris columbiana  
 Sisyrinchium septentrionale  
 Thalictrum dasycarpum

Subgroup: Wetlands

Themes and/or Attributes: CRB007, CRBS05; Channel Type 10, 12

### Species

Antennaria corymbosa  
 Carex atrata atrosquama  
 Carex atrata erecta  
 Carex buxbaumii  
 Carex capillaris  
 Carex dioica  
 Carex flava  
 Carex hystrina  
 Carex paupercula  
 Carex rostrata  
 Carex scopulorum prinophylla  
 Carex tenuiflora  
 Cicuta bulbifera  
 Cypripedium parviflorum  
 Dryopteris carthusiana  
 Dryopteris cristata

Eriophorum viridicarinatum  
 Gaultheria hispidula  
 Gentiana glauca  
 Geum rivale  
 Lycopodium inundatum  
 Muhlenbergia glomerata  
 Platanthera obtusata  
 Rubus acaulis  
 Salix candida  
 Salix maccalliana  
 Salix tweedyi  
 Sanicula marilandica  
 Sisyrinchium septentrionale  
 Spartina pectinata  
 Spiranthus porrifolia  
 Trimorpha elata

Subgroup: Riverine, perennial

Themes and/or Attributes: CRBS05; Channel Type 12; Stream Order 2, 3, 4

### Species

Chrysosplenium tetrandum  
 Salix glauca

Salix tweedyi

Subgroup: Riverine, vernal

Themes and/or Attributes: CRB007, CRBS05; Channel Type 12, 20; Stream Order 1

Species

Crassula aquatica  
Eleocharis rostellata

Ranunculus longirostris  
Teucrium canadense viscidum

Subgroup: Lacustrine

Themes and/or Attributes: CRB007, CRBS05; Channel Type 3, 12

Species

Carex aenea  
Carex sychnocephala

Teucrium canadense viscidum

Wyoming

Subgroup: Aquatic

Themes and/or Attributes: CRBS20

Species

Eleocharis flavescens  
Equisetum fluviatile  
Lemna valdiviana  
Marsilea oligospora  
Najas guadalupensis  
Potamogeton friesii

Potamogeton obtusifolius  
Potamogeton robbinsii  
Potamogeton zosteriformis  
Spirodela polyrrhiza  
Scirpus subterminalis

Subgroup: Riparian

Themes and/or Attributes: CRB007, CRBS05, SAF235; Channel Type 12

Species

Agoseris lackschewitzii  
Aster junciformis (=A. borealis)  
Astragalus robbinsii  
Astragalus terminalis  
Carex buxbaumii  
Carex cusickii  
Carex deweyana bolanderi  
Carex diandra  
Carex echinata  
Carex laeviculmis  
Carex leptalea  
Carex limosa  
Carex livida  
Carex sartwellii  
Cicuta bulbifera

Drosera angelica  
Dulichium arundinaceum  
Epipactis gigantea  
Eriophorum gracile  
Eriophorum viridicarinatum  
Gentianopsis simplex  
Heterocodon rariflorum  
Heterotheca depressa  
Juncus filiformis  
Juncus tweedyi  
Puccinellia fernaldii  
Scheuchzeria palustris  
Selaginella selaginoides  
Veronica scutellata  
Viola renifolia

## FORESTS

Forested ecosystems occupy a significant portion of the moisture gradient within the Interior Columbia Basin (ICB). From the Juniper woodlands of southwestern Idaho, northern Nevada, and south central Oregon to the wet temperate rain forests of western hemlock and western red cedar in northern Idaho and adjacent Washington, moisture exerts a tremendous influence on forest composition. The majority of forest types in the ICB are based on conifers though hardwoods like cottonwood, aspen, and various oak species can be locally important. Humans make intensive use of forests for recreation, commerce (e.g., outfitters and mining), and agriculture (e.g., livestock grazing and timber harvest). Forests are major and important areas for both large and small wildlife, including many endangered and threatened species such as woodland caribou, large forest owls, grizzly bears, and goshawks. The forests of the ICB are floristically rich, a consequence of widely ranging moisture conditions (which are largely due to geography and topography). Dry, open woodlands at low elevations are typically vested with a rich component of shrubs and ephemeral annuals. With increasing elevation and available moisture shrubs become more prominent only to decline in importance in the highest and wettest forest types. Annuals tend to be most important in dry forests and woodlands whereas herbaceous perennials become more important with increasing elevation and available moisture.

Current and historic patterns of resource use within the forests of the ICB pose a threat to the health of these ecosystems. Fire suppression has dramatically increased the risk of stand replacing fires in forests that evolved with periodic low intensity fires. Clear cutting has, in some cases, left sites incapable of being regenerated. Timber cutting prescriptions that focus on maximum commercial return rather than sustainability have similarly degraded many forest stands. Some types of forest (juniper, pinyon, and oak woodlands) are commonly burned or otherwise destroyed (with herbicides or heavy equipment) in order to make room for increased production of plant biomass that is more palatable to livestock, especially cattle. Forests within the ICB have become increasingly susceptible to a variety of pests, pathogens, and stand replacing fires. Insects such as pine and bark beetles, tussock moth, budworm, and borers and fungi like white pine blister rust and a variety of rots have increased in frequency and economic impact over the last 30 years. In relatively dry forest types, the frequency of localized low intensity fires has declined significantly while the recurrence time of extensive high intensity burns has shortened considerably.

### Idaho North

Subgroup: Clearwater Refugium Forests  
Themes and/or Attributes: SAF227

#### Species

*Cardamine constancei*  
*Carex hendersonii*  
*Cladonia verruculosa*  
*Cornus nuttallii*  
*Festuca subuliflora*

*Physcia semipennata*  
*Pilophorus acicularis*  
*Pseudocyphellaria anthraspis*  
*Sphaerophorus tuckermanii*  
*Trientalis latifolia*

Subgroup: Dry Forests

Themes and/or Attributes: SAF210, SAF218, SAF237

Species

Allotropa virgata  
Ceanothus prostratus  
Cryptantha simulans  
Halimolobos perplexa perplexa  
Lobaria linita  
Lobaria scrobiculata  
Lycopodium dendroideum  
Mertensia bella

Mimulus clivicola  
Psoralea physodei  
Ramilina thrausta  
Ribes sanguineum  
Ribes wolfii  
Sanicula graveolens  
Stipa pinetorum

Subgroup: Moist Forests

Themes and/or Attributes: CRBS09, SAF205, SAF206, SAF210, SAF212, SAF217, SAF218, SAF227

Species

Blechnum spicant  
Botrychium lanceolatum lanceolatum  
Botrychium minganense  
Botrychium montanum  
Botrychium pinnatum  
Botrychium simplex  
Cladonia transcendens  
Collema furfuraceum  
Hookeria lucens  
Hypogymnia apinnata

Hypogymnia enteromorpha  
Maianthemum dilatatum  
Oxalis trilliifolia  
Phegopteris connectilis  
Polystichum braunii  
Rubus spectabilis  
Sanicula marilandica  
Streptopus streptopoides brevipes  
Tellima grandiflora  
Thelypteris nevadensis

Idaho South

Subgroup: Pinyon juniper

Themes and/or Attributes: CRBS01, CRBS03, SAF107

Species

Astragalus newberryi castoreus

Camissonia pterosperma

Montana

Subgroup: Cold/moist forests (ABLA/LUHI, ABLA/MEFE, ABLA/CLUN)

Themes and/or Attributes: SAF206

Species

Mertensia bella

Polystichum kruckebergii

Subgroup: Cold/mesic forests (ABLA/VASC, ABLA/VAGL, ABLA-PIAL/VASC, TSME/XETE)

Themes and/or Attributes: SAF205, SAF206, SAF208

Species

Allotropa virgata

Calamagrostis tweedyi

*Lewisia pygmaea nevadensis*  
*Pedicularis contorta rubicunda*

*Synthyris missurica*

Subgroup: Cold/dry forests (PIAL-ABLA, ABLA-PIAL/VASC, PIAL/VASC, ABLA/CAGE, PSME/CARU)  
Themes and/or Attributes: SAF208, SAF210

Species  
*Orogenia fusiformis*  
*Penstemon attenuatus militaris*

*Ranunculus jovis*

Subgroup: Moderate/moist forests (ABLA/CLUN, PIEN/EQAR, ABLA/LIBO, ABGR/CLUN, PIEN/CLUN, THPL/CLUN)  
Themes and/or Attributes: CRBS09, SAF206

Species  
*Cypripedium calceolus*  
*Cypripedium fasciculatum*  
*Cypripedium passerinum*  
*Goodyera repens*  
*Orchis rotundifolia*

*Petasites frigidus*  
*Ribes triste*  
*Satureja douglasii*  
*Viola renifolia*

Subgroup: Moderate/mesic forests (THPL/CLUN, ABGR/CLUN, ABGR/LIBO, PSME/PHMA, PSME/LIBO, ABLA/CLUN, ABLA/LIBO, ABLA/VACA, ABLA/VAGL, ABLA/XETE)  
Themes and/or Attributes: CRBS09, SAF206, SAF210, SAF227

Species  
*Adoxa moschatellina*  
*Calamagrostis tweedyi*  
*Castilleja covilleana*  
*Cirsium brevistylum*  
*Cypripedium fasciculatum*

*Gaultheria ovatifolia*  
*Goodyera repens*  
*Lewisia pygmaea nevadensis*  
*Trifolium eriocephalum piperi*

Subgroup: Moderate/dry forests (PSME/CARU, PSME/SPBE, PSME/SYAL, PSME/VAGL, PSME/CAGE)  
Themes and/or Attributes: SAF210

Species  
*Castilleja covilleana*  
*Clarkia rhomboidea*  
*Orogenia fusiformis*

*Penstemon lemhiensis*  
*Trifolium gymnocarpon*

Subgroup: Warm/moist forests (THPL/OPHO, THPL/ATFI, THPL/GYDR, THPL/CLUN, TSHE/GYDR, TSHE/CLUN)  
Themes and/or Attributes: SAF227

Species  
*Botrychium crenulatum*  
*Botrychium minganense*  
*Botrychium montanum*

*Lilium columbianum*  
*Thelypteris phegopteris*

Subgroup: Warm/mesic forests (PSME/SYAL, PSME/CARU)  
Themes and/or Attributes: SAF210

Species

*Botrychium montanum*  
*Botrychium spatulatum*

*Castilleja cervina*  
*Cirsium brevistylum*

Subgroup: Warm/dry forests (PIPO/AGSP, PIPO/FEID, PSME/FEID)  
Themes and/or Attributes: SAF237

Species

*Arctostaphylos patula*  
*Castilleja cervina*  
*Kelloggia galioides*

*Lomatium geyeri*  
*Madia minima*

**Oregon, Blue Mountains**

Subgroup: Juniper forests  
Themes and/or Attributes: CRBS03, SRM107

Species

*Allium campanulatum*  
*Pediocactus simpsonii robustior*

*Silene scaposa scaposa*  
*Thelypodium eucosmum*

Subgroup: Ponderosa pine/Doug-fir forests  
Themes and/or Attributes: SAF210, SAF237

Species

*Allium bisceptrum*  
*Allium campanulatum*  
*Astragalus tegetarioides*  
*Calochortus longebarbatus peckii*  
*Calochortus longebarbatus longebarbatus*  
*Clematis columbiana*  
*Cypripedium fasciculatum*  
*Cypripedium montanum*  
*Frasera albicaulis idahoensis*

*Lupinus sabinii*  
*Mimulus evanescens*  
*Mimulus hymenophyllus*  
*Mimulus patulus*  
*Mimulus washingtonensis washingtonensis*  
*Orobancha pinorum*  
*Ribes oxycanthoides cognatum*  
*Ribes oxycanthoides irriguum*  
*Silene scaposa scaposa*

Subgroup: Grand fir forests  
Themes and/or Attributes: CRBS09

Species

*Clematis columbiana*  
*Cypripedium fasciculatum*  
*Cypripedium montanum*  
*Dryopteris felix-mas*  
*Listera borealis*

*Lupinus sabinii*  
*Lycopodium annotinum*  
*Lycopodium complanatum*  
*Orobancha pinorum*  
*Ribes oxycanthoides irriguum*

Subgroup: Subalpine fir forests  
Themes and/or Attributes: SAF206

Species

*Allium campanulatum*

*Castilleja glandulifera*

*Cypripedium montanum*

Subgroup: Lodgepole pine forests  
Themes and/or Attributes: SAF218

Species

*Allium campanulatum*  
*Botrychium crenulatum*  
*Botrychium lanceolatum*  
*Botrychium minganense*  
*Botrychium montanum*

Subgroup: Whitebark pine/limber pine forests  
Themes and/or Attributes: SAF208, SAF219

Species

*Allium campanulatum*

**Oregon, East Cascades South**

Subgroup: Red fir and whitefir  
Themes and/or Attributes:

Species

*Asarum wagneri*  
*Carex whitneyi*  
*Collomia mazama*

*Orobancha pinorum*

*Botrychium pinnatum*  
*Listera borealis*  
*Lycopodium annotinum*  
*Platanthera obtusata*

Subgroup: Lodgepole pine  
Themes and/or Attributes:

Species

*Astragalus peckii*  
*Botrychium pumicola*

*Castilleja chlorotica*  
*Mimulus jepsonii*

Subgroup: Western red cedar and western hemlock  
Themes and/or Attributes:

Species

*Botrychium montanum*  
*Botrychium pinnatum*

*Huperzia occidentalis*  
*Lycopodium annotinum*

Subgroup: Juniper/sagebrush  
Themes and/or Attributes:

Species

*Astragalus peckii*

*Silene scaposa scaposa*

Subgroup: Oregon white oak woodlands

Themes and/or Attributes:

Species

*Lomatium suksdorfii*

*Meconella oregana*

Subgroup: Low elevation Ponderosa pine

Themes and/or Attributes:

Species

*Allium campanulatum*

*Carex eleocharis*

*Castilleja chlorotica*

*Cypripedium montanum*

*Mimulus pulcherrimus*

*Penstemon peckii*

Subgroup: Ponderosa pine/mixed conifer woodlands

Themes and/or Attributes:

Species

*Castilleja chlorotica*

*Cypripedium montanum*

*Hieracium Greenei*

*Lithophragma campanulata*

*Mimulus jepsonii*

*Nema phyllanthi*

*Penstemon glaucinus*

Utah

Subgroup: Forest

Themes and/or Attributes: CRBS01, SAF206, SAF210, SAF219

Species

*Astragalus alpinus*

*Astragalus filipes*

*Astragalus iodonanthus*

*Cryptantha spiculifera*

Washington, Columbia Basin

Subgroup: Forest

Themes and/or Attributes: SAF210, SAF218, SAF237

Species

*Antennaria parviflora*

*Corydalis aurea*

*Lupinus sabinii*

*Mimulus pulcherrimus*

*Orobancha pinorum*

*Ribes oxycanthoides cognatum*

*Ribes oxycanthoides irriguum*

Subgroup: Grand fir forest

Themes and/or Attributes: CRBS09

Species

*Corydalis aurea*

*Lupinus sabinii*

*Orobancha pinorum*

*Ribes oxycanthoides cognatum*

*Ribes oxycanthoides irriguum*

Subgroup: Aspen forest  
Themes and/or Attributes: SAF217

Species  
*Corydalis aurea*

*Cypripedium parviflorum*

Subgroup: Ponderosa pine forests  
Themes and/or Attributes: SAF237

Species  
*Antennaria parviflorum*  
*Corydalis aurea*  
*Lupinus sabinii*

*Mimulus pulcherrimus*  
*Ribes oxycanthoides cognatum*  
*Ribes oxycanthoides irriguum*

### Washington, East Cascades North

Subgroup: Oak forests  
Themes and/or Attributes: SAF233

Species  
*Antennaria parvifolia*  
*Astragalus hoodianus*  
*Carex vallicola*  
*Cypripedium montanum*  
*Cypripedium parviflorum*

*Epipactis gigantea*  
*Hackelia diffusa diffusa*  
*Mimulus pulcherrimus*  
*Oxalis suksdorfii*

Subgroup: Douglas-fir forests  
Themes and/or Attributes: SAF210

Species  
*Botrychium lanceolatum*  
*Botrychium lunaria*  
*Botrychium montanum*  
*Carex buxbaumii*  
*Carex vallicola*  
*Corallorhiza trifida*  
*Epipactis gigantea*  
*Hemitelia congestum*  
*Lewisia tweedyi*

*Listera borealis*  
*Montia diffusa*  
*Orobancha pinorum*  
*Oxalis suksdorfii*  
*Platanthera obtusata*  
*Pleuricospora fimbriolata*  
*Sanicula marilandica*  
*Veratrum insolitum*

Subgroup: Subalpine fir forests  
Themes and/or Attributes: SAF206

Species  
*Botrychium lanceolatum*  
*Botrychium lunaria*  
*Botrychium montanum*  
*Carex atrata erecta*  
*Chrysosplenium tetrandrum*

*Corallorhiza trifida*  
*Hemitelia congestum*  
*Lewisia tweedyi*  
*Listera borealis*  
*Platanthera obtusata*

Subgroup: Subalpine larch forests  
Themes and/or Attributes: CRBS10, SAF206

Species

*Carex atrata* *erecta*

*Carex vallicola*

**Washington, Okanogan Highlands**

Subgroup: Forest  
Themes and/or Attributes: SAF206, SAF210, SAF218, SAF227

Species

*Astragalus microcystis*  
*Botrychium lanceolatum*  
*Botrychium lunaria*  
*Botrychium minganense*  
*Botrychium montanum*  
*Botrychium pinnatum*  
*Carex xerantica*

*Dodecatheon pulchellum watsonii*  
*Orobancha pinorum*  
*Phacelia franklinii*  
*Ribes oxyacanthoides cognatum*  
*Ribes oxyacanthoides irriguum*  
*Vaccinium myrtilloides*  
*Zigadenus elegans*

**Wyoming**

Subgroup: Dry Forests  
Themes and/or Attributes: SAF218, SAF237

Species

*Arceuthobium douglasii*  
*Calamagrostis scopulorum*

*Carex preslii*  
*Hieracium scouleri*

Subgroup: Moist Forests  
Themes and/or Attributes: CRBS09, SAF210, SAF217, SAF218

Species

*Botrychium virginianum*  
*Calamagrostis scopulorum*  
*Dryopteris expansa*  
*Festuca occidentalis*  
*Gymnocarpium dryopteris*  
*Listera caurina*  
*Listera convallarioides*

*Melica smithii*  
*Ophioglossum vulgatum*  
*Rubus acaulis*  
*Trautvetteria carolinensis*  
*Viola orbiculata*  
*Xerophyllum tenax*

**GRASSLANDS AND SHRUBLANDS**

Grasslands and shrublands occur throughout the entire elevational range of the Interior Columbia Basin (ICB). Shrublands tend to occupy relatively xeric sites that can be as large as a landscape or as small as several meters square. Grasslands on the other hand may occur in dry or wet areas. Bunchgrasses and annual species are favored where conditions are dry (chronically or seasonally)

whereas rhizomatous grasses tend to occur where soil moisture is more abundant or consistent. Grasslands and shrublands are important habitats for many small animals. Large animals often use these areas to browse or graze but few live there exclusively (due largely to the lack of adequate cover). Insect, reptile, rodent, and bird faunas are typically diverse in both grasslands and shrublands (though may be locally impoverished in areas under unsustainable land management practices). The floristic diversity of grasslands and shrublands tends to be strongly tied to available soil moisture (except in cases of azonal soils and lithologies). Moist grasslands, especially where soils are deep, are commonly rich in forb diversity (e.g., the Palouse) whereas very sandy areas (e.g., St. Anthony Dunes, Idaho and portions of the Great Sandy Desert, Oregon) commonly have a mere handful of species. Mountain shrublands commonly have a diverse understory of forbs and perennial grasses whereas desert shrublands are commonly more rich with forbs and annuals.

The history of use and conversion in shrublands and grasslands extends back to pre-European settlement times. Native Americans were known to have burned some of these habitats for a variety of reasons, though usually with only local impacts. Beginning in the 1860's, when domestic livestock grazing became important throughout the ICB, grasslands and shrublands have been continuously converted or degraded. Most of these areas are or were heavily overgrazed (though the Taylor Grazing Act of 1939 instituted significant reforms). Perhaps more insidious has been the introduction and establishment of a broad range of exotic plant species that has been directly attributed to livestock grazing. Exotics such as cheatgrass and Russian thistle have converted millions of acres of relatively diverse shrublands and grasslands to depauperate, fire prone landscapes with significantly lowered economic value. Agricultural conversion has impacted grasslands more than shrublands, especially in valley bottoms. More than 95% of the extensive grasslands of northern Idaho and adjacent eastern Washington have been converted to farmland. Water diversions for agriculture have had significant dilatory effects on the shrublands and grasslands in most watersheds surrounding the major agricultural centers within the ICB. In local areas around burgeoning population centers, many acres of grasslands and shrublands have and continue to be converted for housing and industry. Significant recreational impacts to grasslands and shrublands tends to be localized but are occasionally severe. Activities involving all-terrain or off-road vehicles (including horses) are usually the most destructive often causing severe erosion, losses in vegetation, and slope failures.

#### Idaho North

Subgroup: Canyon grasslands

Themes and/or Attributes: CRBS06, CRBS07, SRM101, SRM304

##### Species

*Astragalus riparius*

*Calochortus macrocarpus maculosa*

*Camassia cusickii*

*Chrysothamnus nauseosus nanus*

*Crepis bakeri idahoensis*

*Erigeron engelmannii davisii*

*Mimulus washingtonensis ampliatus*

Subgroup: Montane balds and ridges grasslands

Themes and/or Attributes: CRBS06, SRM101, SRM304

Species

*Astragalus bourgovii*  
*Carex californica*

*Eriogonum capistratum welshii*

Subgroup: Prairie grasslands

Themes and/or Attributes: CRBS06, CRBS07, SRM101, SRM304

Species

*Astragalus bisulcatus bisulcatus*  
*Bouteloua gracilis*

*Thelomma ocellatum*  
*Trifolium plumosum amplifolium*

Idaho South

Subgroup: Low sage grassland shrubland

Themes and/or Attributes: SRM403, SRM406

Species

*Astragalus salmonis*  
*Gymnosteris parvula*  
*Pediocactus simpsonii robustior*

*Scutellaria nana nana*  
*Stylocline filaginea*

Subgroup: General grasslands and shrublands

Themes and/or Attributes: CRB003, CRBS06, CRBS07, SRM101, SRM104, SRM304, SRM401, SRM402, SRM403, SRM406, SRM607

Species

*Allium anceps*  
*Astragalus drummondii*  
*Astragalus newberryi castoreus*  
*Astragalus salmonis*  
*Astragalus tetrapteris*  
*Camissonia palmeri*  
*Camissonia pterosperma*  
*Carex tumulicola*  
*Chaenactis stevioides*  
*Coryphantha vivipara*  
*Cuscuta denticulata*  
*Eriogonum desertorum*  
*Gymnosteris nudicaulis*  
*Gymnosteris parvula*  
*Ipomopsis polycladon* (= *Gilia polycladon*)

*Lomatium dissectum dissectum*  
*Lupinus uncialis*  
*Muhlenbergia racemosa*  
*Oryzopsis micrantha*  
*Oxytropis besseyi salmonensis*  
*Pediocactus simpsonii robustior*  
*Peraphyllum ramosissimum*  
*Piptatherum micranthum*  
*Psathyrotes annua*  
*Scutellaria nana nana*  
*Stipa viridula*  
*Stylocline filaginea*  
*Thelomma ocellatum*  
*Townsendia scapigera*

Subgroup: Sandy grasslands and shrublands

Themes and/or Attributes: CRBS06, CRBS07, SRM607

Species

*Chaenactis stevioides*  
*Glyptoleura marginata*  
*Gymnosteris nudicaulis*

*Oxytheca dendroidea*  
*Psathyrotes annua*  
*Sporobolus asper*

## Montana

Subgroup: High-elevation Idaho fescue  
Themes and/or Attributes: CRBS06, SRM304

### Species

*Allium simillimum*  
*Draba densifolia*  
*Erigeron formosissimus viscidus*  
*Lesquerella klausii*  
*Mimulus nanus*

*Penstemon lemhiensis*  
*Potentilla quinquefolia*  
*Polygonum douglasii austinae*  
*Saxifraga apetala*  
*Thlaspi parviflorum*

Subgroup: Low-elevation Idaho fescue  
Themes and/or Attributes: CRBS06, SRM304

### Species

*Allium parvum*  
*Astragalus convallarius convallarius*  
*Athyasus pusillus*  
*Camissonia andina*  
*Erigeron linearis*  
*Halimolobos perplexa lemhiensis*  
*Idaho scapigera*

*Lesquerella carinata languida*  
*Penstemon lemhiensis*  
*Penstemon payettensis*  
*Phlox kelseyi missoulensis*  
*Trifolium gymnocarpon*  
*Myosotis verna*

Subgroup: Bluebunch wheatgrass  
Themes and/or Attributes: CRBS06, SRM101

### Species

*Allium columbianum*  
*Camissonia andina*  
*Ipomopsis minitiflora*

*Lagophylla ramosissima*  
*Lesquerella carinata languida*  
*Phlox kelseyi missoulensis*

Subgroup: Low-elevation rough fescue  
Themes and/or Attributes: CRBS06, SRM304

### Species

*Aster frondosus*  
*Astragalus convallarius convallarius*  
*Atriplex truncata*  
*Boissduvalia densiflora*  
*Botrychium hesperium*  
*Botrychium paradoxum*  
*Delphinium burkei*

*Grindelia howellii*  
*Myosotis verna*  
*Oxytropis campestris columbiana*  
*Oxytropis lagopus conjugens*  
*Phlox kelseyi missoulensis*  
*Silene spaldingii*

Subgroup: High-elevation rough fescue  
Themes and/or Attributes: CRBS06, SRM304

### Species

*Allium fibrillum*  
*Botrychium paradoxum*

*Polygonum douglasii austinae*

Subgroup: Low-elevation sagebrush  
Themes and/or Attributes: SRM401, SRM403

Species

Agastache cusickii  
Allium parvum  
Arabis fecunda  
Aster frondosus  
Astragalus ceramicus apus  
Astragalus platytropis  
Astragalus scaphoides  
Astragalus terminalis  
Boissduvalia densiflora  
Cryptantha fendleri  
Delphinium bicolor no  
Elymus flavescens  
Erigeron linearis  
Grindelia howellii  
Halimolobos perplexa lemhiensis  
Halimolobos virgata

Hutchinsia procumbens  
Ipomopsis congesta crebrifolia  
Ipomopsis minutiflora  
Kochia americana  
Lesquerella pulchella  
Lomatium attenuatum  
Oenothera pallida idahoensis  
Oxytropis lagopus conjugens  
Penstemon lemhiensis  
Phacelia scopulina  
Potentilla plattensis  
Ranunculus jovis  
Sphaeralcea munroana  
Sphaeromeria argentea  
Sphaeromeria capitata  
Townsendia florifer

Subgroup: High-elevation sagebrush  
Themes and/or Attributes: SRM402, SRM421

Species

Allium acuminatum  
Allium parvum  
Astragalus terminalis  
Calochortus bruneauensis  
Erigeron formosissimus viscidus  
Eriogonum caespitosum  
Halimolobos perplexa lemhiensis  
Haplopappus macronema linearis  
Helenium hoopesii

Ipomopsis congesta crebrifolia  
Juncus hallii  
Mimulus nanus  
Oxytropis lagopus conjugens  
Penstemon lemhiensis  
Saxifraga apetala  
Sphaeromeria argentea  
Thlaspi parviflorum  
Townsendia nuttallii

Oregon, Basin and Range

Subgroup: Mountain big sage  
Themes and/or Attributes:

Species

Allium bisceptrum  
Allium campanulatum  
Astragalus tegetarioides  
Caulanthus major  
Crepis modocensis modocensis  
Hackelia patens patens

Orthocarpus cuspidatus cryptanthus  
Pedicularis centranthera  
Penstemon janishiae  
Penstemon kingii  
Penstemon seorsus  
Symphoricarpos longiflorus

Subgroup: Low sage  
Themes and/or Attributes:

Species  
*Artemisia papposa*  
*Asclepias cryptoceras*  
*Astragalus tegetarioides*

Subgroup: Salt Desert Shrublands  
 Themes and/or Attributes:

Species  
*Allenrolfea occidentalis*  
*Antirrhinum kingii*  
*Chaenactis macrantha*  
*Chaenactis stevioides*  
*Cryptantha propria*  
*Ephedra nevadensis*

Subgroup: Basin big sage  
 Themes and/or Attributes:

Species  
*Astragalus alvordensis*  
*Astragalus atratus owyheensis*  
*Camissonia palmeri*  
*Eriogonum brachyanthum*  
*Hackelia cronquistii*

Subgroup: Wyoming big sage  
 Themes and/or Attributes:

Species  
*Argemone munita rotundata*  
*Astragalus solitarius*  
*Astragalus tetrapterus*  
*Caulanthus crassicaulis*  
*Caulanthus pilosus*  
*Cryptantha propria*  
*Cymopterus purpurascens*  
*Gilia salticola*  
*Hymenoxys cooperi canescens*

## Oregon, Blue Mountains

Subgroup: Idaho fescue grasslands  
 Themes and/or Attributes: CRBS06, SRM304

Species  
*Astragalus arthurii*  
*Calochortus macrocarpus maculosum*  
*Erigeron disparipilus*  
*Erigeron engelmannii davisii*

*Hymenoxys lemmonii*  
*Orthocarpus cuspidatus cranthus*  
*Trifolium owyheense*

*Ephedra viridis*  
*Langloisia setosissima punctata*  
*Malacothrix torreyi*  
*Pediocactus simpsonii robustior*  
*Phacelia gymnoclada*

*Malacothrix glabrata*  
*Phacelia gymnoclada*  
*Stylcline psilocarphoides*  
*Trifolium owyheense*

*Lomatium ravenii*  
*Lupinus biddlei*  
*Pectocarya setosa*  
*Penstemon janishiae*  
*Penstemon kingii*  
*Penstemon perpulcher*  
*Penstemon seorsus*  
*Phacelia gymnoclada*  
*Stephanomeria malheurensis*

*Frasera albicaulis idahoensis*  
*Lupinus sabinii*  
*Silene spaldingii*

Subgroup: Bluebunch wheatgrass grasslands  
Themes and/or Attributes: CRBS06, SRM101

Species

*Asclepias cryptoceras*  
*Astragalus arthurii*  
*Calochortus macrocarpus maculosus*  
*Erigeron disparipilus*  
*Erigeron engelmannii davisii*  
*Frasera albicaulis idahoensis*

*Haplopappus radiatus*  
*Lomatium rollinsii*  
*Lupinus sabinii*  
*Mirabilis macfarlanei*  
*Silene scaposa scaposa*  
*Thelypodium eucosmum*

Subgroup: Sandberg bluegrass grasslands  
Themes and/or Attributes: CRBS06

Species

*Allium brandegei*  
*Allium geyeri*  
*Allium tolmiei platyphyllum*  
*Astragalus salmonis*  
*Collomia macrocalyx*

*Lomatium ochocensis*  
*Oryzopsis hendersonii*  
*Oryzopsis wallowaensis*  
*Primula cusickiana*

Subgroup: Shrublands, general  
Themes and/or Attributes: SRM104, SRM322, SRM402, SRM421

Species

*Ribes cereum colubrinum*  
*Rubus bartonianus*

*Silene spaldingii*

Subgroup: Rigid sage  
Themes and/or Attributes: SRM406

Species

*Allium brandegei*  
*Allium macrum*

*Oryzopsis hendersonii*  
*Oryzopsis wallowaensis*

Subgroup: Big sage  
Themes and/or Attributes: SRM401, SRM403

Species

*Allium brandegei*  
*Astragalus atratus owyheensis*  
*Astragalus tegetarioides*

*Eriogonum ochrocephalum calcareum*  
*Haplopappus radiatus*

Subgroup: Mountain big sage  
Themes and/or Attributes: SRM402

Species

*Allium campanulatum*

Subgroup: Low sage  
Themes and/or Attributes: SRM406

Species

*Artemisia arbuscula thermopola*  
*Astragalus salmonis*

*Oryzopsis wallowaensis*

**Oregon, East Cascades South**

Subgroup: Low sagebrush

Themes and/or Attributes:

Species

*Allium macrum*  
*Artemisia arbuscula thermopola*  
*Castilleja thompsonii*  
*Claytonia umbellata*  
*Collomia macrocalyx*  
*Coryphantha vivipara vivipara*  
*Lomatium farinosum hambleniae*

*Lomatium watsonii*  
*Mimulus pygmaeus*  
*Oryzopsis hendersonii*  
*Pediocactus simpsonii robustior*  
*Penstemon seorus*  
*Silene scaposa scaposa*  
*Talinum spinescens*

Subgroup: Wyoming and Mountain big sage

Themes and/or Attributes:

Species

*Astragalus hoodianus*  
*Astragalus howellii*  
*Astragalus peckii*  
*Astragalus salmonis*  
*Astragalus tyghensis*  
*Camissonia pygmaea*  
*Castilleja chlorotica*  
*Caulanthus pilosus*  
*Crepis modocensis modocensis*  
*Cryptantha propria*

*Cryptantha rostellata*  
*Linanthus bolanderi*  
*Lupinus latifolius thompsonianus*  
*Mimulus pygmaeus*  
*Nicotiana quadrivalis*  
*Ranunculus reconditis*  
*Ribes inermis klamathense*  
*Scribneria bolanderi*  
*Silene nuda insectivora*  
*Silene scaposa scaposa*

Subgroup: Curleaf Mountain Mahogany

Themes and/or Attributes:

Species

*Melica stricta*

**Oregon, High Lava Plains**

Subgroup: Salt Desert Shrub

Themes and/or Attributes:

Species

*Astragalus applegatei*  
*Plagiobothrys salsus*

*Thelypodium brachycarpum*  
*Thelypodium howellii howellii*

## Utah

Subgroup: Grassland

Themes and/or Attributes: CRBS06, CRBS07, SRM101, SRM304, SRM607

### Species

Haplopappus hirtus

Lomatium cous

Ligusticum grayi

Senecio foetidus

Subgroup: Shrubland

Themes and/or Attributes: CRB003, CRBS07, SRM104, SRM107, SRM322, SRM401, SRM402, SRM403, SRM406, SRM421

### Species

Arenaria fendleri aculeata

Mimulus breweri

Aster scopulorum

Paeonia brownii

Astragalus purshii glareosus

Pedicularis contorta

Cryptantha interrupta

Phacelia ivesiana glandulifera

Erigeron linearis

Silene oregana

Eriogonum brevicaulis desertorum

Stipa thurberiana

Eriophyllum lanatum

## Washington, Columbia Basin

Subgroup: Deep, fine textured soils

Themes and/or Attributes: CRBS06, CRBS07, SRM101, SRM304, SRM607

### Species

Astragalus cusickii cusickii

Erigeron piperianus

Collinsia sparsiflora bruceae

Trifolium plumosum plumosum

Subgroup: Deep, coarse textured soils

Themes and/or Attributes: CRBS06, CRBS07, SRM101, SRM304, SRM607

### Species

Hackelia hispida hispida

Lomatium rollinsii

Subgroup: Shallow soils

Themes and/or Attributes: CRBS06, CRBS07, SRM101, SRM304, SRM607

### Species

Draba douglasii douglasii

Linanthus bolanderi

Eriogonum maculatum

Mimulus washingtonensis

Githopsis specularioides

Penstemon denstus variabilis

Hackelia diffusa diffusa

Saxifraga integrifolia apetala

Subgroup: Shrubland Deep, fine textured soils

Themes and/or Attributes: CRBS07, SRM104, SRM322, SRM401, SRM402, SRM403, SRM406, SRM421

### Species

*Astragalus arrectus*  
*Balsamorhiza deltoidea*  
*Cuscuta denticulata*

*Erigeron piperianus*  
*Nicotiana attenuata*

Subgroup: Deep, coarse textured soils  
Themes and/or Attributes: CRBS07, SRM104, SRM322, SRM401, SRM402, SRM403, SRM406, SRM421

Species  
*Arabis crucisetosa*  
*Arenaria franklinii thompsonii*  
*Cuscuta denticulata*

*Cryptantha leucophaea*  
*Oenothera cespitosa*  
*Oenothera flava*

Subgroup: Deep, saline-alkali soils  
Themes and/or Attributes: CRBS07, SRM104, SRM322, SRM401, SRM402, SRM403, SRM406, SRM414, SRM421

Species  
*Astragalus geyeri*

*Thelypodium howellii howellii*

Subgroup: Shallow soils  
Themes and/or Attributes: CRBS07, SRM104, SRM322, SRM401, SRM402, SRM403, SRM406, SRM421

Species  
*Allium constrictum*  
*Astragalus arthurii*  
*Astragalus misellus pauper*  
*Cryptantha interrupta*  
*Cryptantha rostellata*  
*Eatonella nivea*  
*Eriogonum maculatum*

*Hackelia hispida disjuncta*  
*Juncus uncialis*  
*Pectocarya setosa*  
*Pediocactus simpsonii robustior*  
*Phacelia tetramera*  
*Polygonum austiniiae*

#### Washington, East Cascades North

Subgroup: Shrublands  
Themes and/or Attributes: SRM104, SRM401, SRM402, SRM403, SRM406, SRM421

Species  
*Aster sibericus meritus*  
*Astragalus arrectus*  
*Astragalus hoodianus*  
*Astragalus misellus pauper*  
*Carex stenophylla*  
*Collinsia sparsiflora bruceae*  
*Delphinium xantholeucum*  
*Erigeron piperianus*  
*Githopsis specularioides*  
*Hackelia diffusa diffusa*  
*Hackelia hispida disjuncta*  
*Iliamna longisepala*  
*Linanthus bolanderi*

*Lomatium quintuplex*  
*Mimulus suksdorfii*  
*Nicotiana attenuata*  
*Oryzopsis hendersonii*  
*Pectocarya setosa*  
*Pediocactus simpsonii*  
*Pellaea brachyptera*  
*Phacelia franklinii*  
*Potentilla nivea*  
*Ranunculus reconditus*  
*Saxifraga apetala*  
*Silene douglasii manatha*  
*Valeriana columbiana*

Subgroup: Grasslands

Themes and/or Attributes: CRBS06, SRM101, SRM304, SRM607

Species

*Botrychium simplex*

*Cypripedium montanum*

*Cypripedium parviflorum*

*Eryngium petiolatum*

*Orthocarpus bracteatus*

*Potentilla diversifolia* *perdissecta*

*Ribes oxyacanthoides* *cognatum*

### Washington, Okanogan Highlands

Subgroup: Rhizomatous grasses dominant

Themes and/or Attributes: CRB007, CRBS06

Species

*Botrychium simplex*

*Carex vallicola*

*Sisyrinchium septentrionale*

Subgroup: Bunchgrass dominant

Themes and/or Attributes: SRM101, SRM304

Species

*Carex xerantica*

*Cryptantha interrupta*

### Wyoming

Subgroup: Grasslands

Themes and/or Attributes: CRBS06, CRBS07, SRM101, SRM304, SRM607

Species

*Lomatium bicolor*

*Triteleia grandiflora*

Subgroup: Shrublands

Themes and/or Attributes: CRB003, CRBS07, SRM104, SRM107, SRM322, SRM401, SRM402, SRM403, SRM406, SRM421

Species

*Artemisia spiciformis*

*Calochortus eurycarpus*

*Clarkia pulchella*

*Gayophytum humile*

*Haplopappus macronema linearis*

*Ipomopsis crebifolia*

*Kelloggia galioides*

*Lepidium densiflorum pubicarpum*

*Monardella odoratissima glauca*

*Orobanche corymbosa corymbosa*

*Orobanche ludoviciana arenosa*

*Paeonia brownii*

*Perideridia bolanderi bolanderi*

*Townsendia florifer*

## ROCK

The rocky habitats within the Interior Columbia Basin (ICB) usually occur as inclusions within other types of habitats. They may be represented as sand dunes, cliffs, mountain tops, talus slopes, lava flows and cinder cones, and scablands. There are some large extensive areas of rocky habitats however, including the Crater's of the Moon area in Idaho and the cliffs of the Columbia River Gorge. These areas are usually low in biological (both floral and faunal) diversity but commonly harbor edaphically endemic species (especially when the rocks are azonal). Limestone and dolomite, rhyolitic ashes, and serpentine commonly have several substrate specific plant species whereas basalt and granite outcrops have very few. Animals typically use rocky habitats only occasionally, though a few species such as marmots, picas, and rock wrens live and reproduce there.

Rocky areas are habitats typically used for relatively few human activities. Mining activities are usually thoroughly destructive though mostly highly localized. Most recreational uses have little impact, the exception being off-road and all-terrain vehicles. Motorized recreation can destroy plant and animal habitat, cause or exacerbate erosion problems, and it the most destructive recreational use of rocky habitats. In some areas, livestock grazing and introduced exotic plant species have significantly impacted the quality of rock inhabiting plant communities.

### Idaho North

Subgroup: High Elevation Rock  
Themes and/or Attributes: CRB007

#### Species

*Adiantum aleuticum*

*Cladonia luteoalba*

*Collomia debilis camporum*

*Lewisia kelloggii*

*Romanzoffia sitchensis*

Subgroup: Talus Rock

Themes and/or Attributes: CRB007

#### Species

*Lomatium salmoniflorum*

*Pentagramma triangularis triangularis*

*Thelypodium lacinatedum streptanthoides*

### Idaho South

Subgroup: Badlands

Themes and/or Attributes: CRB007

#### Species

*Aspicilia fruticulosa*

*Astragalus amblytropis*

*Astragalus aquilonius*

*Blepharidachne kingii*

*Eriogonum shockleyi packardiae*

*Eriogonum shockleyi shockleyi*

*Hymenoxys richardsonii*

*Ipomopsis polycladon* (= *Gilia polycladon*)

Lupinus uncialis  
Nemacladus rigidus

Subgroup: Cinder  
Themes and/or Attributes: CRB007

Species  
Dimeresia howellii

Subgroup: Clay Ash  
Themes and/or Attributes: CRB007

Species  
Cymopterus acaulis greeleyorum

Subgroup: Non-Clay Ash  
Themes and/or Attributes: CRB007

Species  
Eriogonum ochrocephalum calcareum

Subgroup: Rock Outcrops  
Themes and/or Attributes: CRB007

Species  
Asplenium viride

Penstemon janishiae  
Xanthoparmelia idahoensis

Eatonella nivea

Phacelia lutea calva

Mentzelia torreyi acerosa

Astragalus gilviflorus

## Oregon Basin and Range and Owyhee Uplands

Subgroup: Talus, Scree and Gravels  
Themes and/or Attributes: CRB007

Species  
Agastache cusickii  
Antirrhinum kingii  
Collomia macrocalyx  
Collomia renata

Eriogonum nutans nutans  
Eriogonum prociduum  
Phacelia gymnoclada

Subgroup: Basalt and Rhyolite Rock Outcrops  
Themes and/or Attributes: CRB007

Species  
Agastache cusickii  
Astragalus tegetarioides  
Artemisia packardiae  
Claytonia umbellata  
Cymopterus nivalis  
Draba sphaeroides cusickii  
Dryopteris filix-mas  
Hackelia ophiobia

Hackelia patens patens  
Haplopappus macronema macronema  
Ivesia shockleyi  
Melica stricta  
Mirabilis bigelovii retrorsa  
Pediocactus simpsonii robustior  
Penstemon davidsonii prateritus  
Polemonium viscosum

*Polystichum kruckebergii*  
*Saxifraga adscendens oregonensis*  
*Sedum debile*

Subgroup: Succor Creek Ash  
Themes and/or Attributes: CRB007

Species  
*Astragalus sterilis*  
*Chaenactis cusickii*  
*Cymopterus acaulis greeleyorum*

Subgroup: Leslie Gulch Ash  
Themes and/or Attributes: CRB007

Species  
*Astragalus sterilis*  
*Eriogonum novonudum*  
*Ivesia rhypara rhypara*  
*Lomatium ravenii*

Subgroup: Non-specific Ash  
Themes and/or Attributes: CRB007

Species  
*Allium lemmonii*  
*Amsinckia carinata*  
*Argemone munita rotundata*  
*Astragalus alvordensis*  
*Astragalus sterilis*  
*Astragalus tegetarioides*  
*Astragalus tetrapteris*  
*Chaenactis cusickii*  
*Chaenactis macrantha*  
*Chaenactis stevioides*  
*Cryptantha propria*  
*Cymopterus nivalis*

Subgroup: Sand  
Themes and/or Attributes: CRB007

Species  
*Astragalus alvordensis*  
*Astragalus atratus owyheensis*  
*Astragalus mufordiae*  
*Astragalus tetrapteris*  
*Camissonia palmeri*

*Selaginella watsonii*  
*Symphoricarpos longiflorus*

*Mentzelia mollis*  
*Phacelia lutea calva*

*Mentzelia packardiae*  
*Phacelia lutea mackenzieorum*  
*Senecio erterae*  
*Trifolium owyheense*

*Eriogonum crosbyae*  
*Eriogonum cusickii*  
*Eriogonum novonudum*  
*Eriogonum ochrocephalum*  
*Eriogonum prociduum*  
*Eriogonum salicomioides*  
*Ivesia rhypara rhypara*  
*Ivesia rhypara shellyi*  
*Langloisia setosissima punctata*  
*Stanleya confertiflora*  
*Trifolium leibergii*  
*Trifolium owyheense*

*Chaetadelpa wheeleri*  
*Eriogonum nutans nutans*  
*Hackelia cronquistii*  
*Stylocline psilocarphoides*

## Oregon, Blue Mountains

Subgroup: Ash

Themes and/or Attributes: CRB007

### Species

*Allium pleinthum*

*Astragalus diaphanus diurnus*

*Eriogonum ochrocephalum calcareum*

*Lomatium rollinsii*

*Lupinus cusickii*

*Thelypodium eucosmum*

Subgroup: Cinder

Themes and/or Attributes: CRB007

### Species

*Mimulus evanescens*

*Mimulus hymenophyllus*

*Mimulus patulus*

Subgroup: Cliffs

Themes and/or Attributes: CRB007

### Species

*Allium geyeri*

*Anemone multifida tetonensis*

*Asplenium trichomanes*

*Bolandra oregana*

*Carex nardina*

*Cheilanthes feei*

*Cryptogramma stelleri*

*Draba lemmonii cyclomorpha*

*Epilobium latifolium*

*Epipactis gigantea*

*Geum rossii turbinatum*

*Heuchera grossularifolia grossularifolia*

*Leptodactylon pungens hazeliae*

*Mimulus washingtonensis washingtonensis*

*Pellaea bridgesii*

*Phlox multiflora*

*Polystichum kruckebergii*

*Rubus bartonianus*

*Salix wolfii*

*Selaginella watsonii*

Subgroup: Scablands

Themes and/or Attributes: CRB007

### Species

*Allium bisceptrum*

*Allium dictyon*

*Allium geyeri*

*Allium tolmei platyphyllum*

*Astragalus salmonis*

*Claytonia umbellata*

*Erigeron engelmannii davisii*

*Lewisia columbiana wallowensis*

*Lomatium ochocensis*

*Mimulus washingtonensis washingtonensis*

*Oryzopsis hendersonii*

*Oryzopsis wallowaensis*

*Pediocactus simpsonii robustior*

*Primula cusickiana*

*Ranunculus oresterus*

Subgroup: Talus

Themes and/or Attributes: CRB007

### Species

*Claytonia umbellata*

*Luina serpentina*

*Mirabilis macfarlanei*

*Ranunculus verecundus*

Ribes oxycanthoides cognatum  
Rubus bartonianus

Subgroup: Other Rocks  
Themes and/or Attributes: CRB007

Species  
Lomatium ravenii

### Oregon, East Cascades South

Subgroup: Ash, Clay, Sterile Basalt Gravels  
Themes and/or Attributes:

Species  
Allium pleianthum  
Astragalus diaphanus diaphanus  
Astragalus diaphanus diurnus  
Chaenactis nevii

Subgroup: Cliffs and Talus  
Themes and/or Attributes:

Species  
Arabis furcata  
Erigeron howellii  
Erigeron oreganus  
Heuchera grossularifolia tenuifolia

Subgroup: Scablands  
Themes and/or Attributes:

Species  
Allium campanulatum  
Allium lemmonii  
Allium macrum  
Allium madidum  
Artemisia papposa  
Asclepias cryptoceras

Subgroup: Stiff sage  
Themes and/or Attributes:

Species  
Allium macrum

### Utah

Subgroup: Rock

Suksdorfia violacea

Eriogonum prociduum  
Mimulus washingtonensis washingtonensis  
Thelypodium eucosmum

Mimulus jungermannioides  
Penstemon barrettiae  
Suksdorfia violacea  
Talinum spinescens

Astragalus salmonis  
Chaenactis macrantha  
Chaenactis stevioides  
Eriogonum chrysops  
Phacelia gymnoclada

Allium madidum

Themes and/or Attributes: CRB007

Species

*Eupatorium occidentale*

*Polystichum kruckebergii*

Washington, Columbia Basin

Subgroup: Bedrock/crevice

Themes and/or Attributes: CRB007

Species

*Cheilanthes feei*

*Hackelia cinerea*

*Lomatium serpentinum*

*Lossetacon nevadensis*

Subgroup: Talus/rubble

Themes and/or Attributes: CRB007

Species

*Lomatium cusickii*

*Lomatium laevigatum*

*Ribes cereum columbrinum*

Washington, East Cascades North

Subgroup: Rock

Themes and/or Attributes: CRB007

Species

*Astragalus whitney sonneanus*

*Anemone nuttalliana*

*Bolandra oregana*

*Carex proposita*

*Carex stenophylla*

*Castilleja cervina*

*Chaenactis ramosa*

*Chaenactis thompsonii*

*Claytonia megarhiza nivalis*

*Cryptantha interrupta*

*Erigeron basalticus*

*Erigeron humilis*

*Erigeron leibergii*

*Erigeron piperianus*

*Erigeron salishii*

*Eritrichium nanum elongatum*

*Geum rossii depressum*

*Hackelia diffusa diffusa*

*Hackelia hispida disjuncta*

*Hackelia hispida hispida*

*Heuchera grossulariifolia tenuifolia*

*Lewisia tweedyi*

*Lomatium cuspidatum*

*Lomatium tuberosum*

*Lomatium watsonii*

*Luzula arcuata*

*Nicotiana attenuata*

*Parnassia kotzebuei kotzebuei*

*Pediocactus simpsonii*

*Pellaea breweri*

*Phacelia franklinii*

*Poa curtifolia*

*Poa gracillima multnomae*

*Polypodium hesperium*

*Polystichum lemmonii*

*Potentilla nivea*

*Potentilla quinquefolia*

*Salix brachycarpa*

*Saxifraga cernua*

*Saxifraga debilis*

*Swertia perennis*

*Valeriana columbiana*

*Veratrum insolitum*

## Washington, Okanogan Highlands

Subgroup: Talus slope

Themes and/or Attributes: CRB007

### Species

*Ribes oxyacanthoides cognatum*

*Ribes oxyacanthoides irriguum*

*Saxifraga adscendens gonensi*

*Saxifraga cernua*

*Saxifraga debilis*

Subgroup: Moist rocky substrate

Themes and/or Attributes: CRB007

### Species

*Cryptogramma stelleri*

Subgroup: Dry rocky substrate

Themes and/or Attributes: CRB007

### Species

*Dryas drummondii*

*Talinum sediforme*

## Wyoming

Subgroup: Rocky Limestone

Themes and/or Attributes: CRB007

### Species

*Adiantum aleuticum*

*Antennaria aromatica*

*Asplenium viride*

*Cryptogramma stelleri*

*Draba borealis*

*Erigeron tweedyi*

*Pellaea glabella simplex*

Subgroup: Igneous and Metamorphic

Themes and/or Attributes: CRB007

### Species

*Aspidotis densa*

*Lycopodium selago*

*Polystichum scopulinum*

## APPENDIX 4

### Rare Plant Communities

## Rare Plant Communities

With increases in human influences on ecological processes, vegetation structure and function, there has been a significant loss of native plant communities and ecosystems across the United States (Nature Conservancy 1974). Concerns for the maintenance of diversity exists for all its interactive levels, including genetic, species, communities and ecosystems (Langner and Flather 1994). Concerns such as these prompted the need to identify and assess the status of rare plant communities within the Columbia River Basin.

Plant communities that were inherently rare because of a unique set of abiotic features, and those that were once more common, but reduced due to management, are especially vulnerable to extirpation. For example, the bunchgrass grasslands of the Palouse region, once expansive in area, have been reduced to a few remnant stands due to agricultural conversion. Low elevation cedar/hemlock old-growth forests, on the other hand, may never have occupied a large proportion of the landscape, yet have been disproportionately affected due to the extraction of large volumes of timber available in these highly productive areas. It is hoped that the information given here will assist managers by placing the concerns for sustainability of these communities in context with their status at a regional scale. In addition, potential for restoration of some communities may be prioritized and perhaps expedited by knowledge as to which communities are globally at risk, and what the known threats and trends are for these unique areas.

Plant communities are assemblages of organisms that are repeatable over the landscape (Bourgeron and Engelking 1994). Many classification systems have been applied to characterize a grouping of plant species as a definable unit. Although there is still a need for continued classification and standardization, the Natural Heritage Program Network has gone far in compiling and standardizing a classification of plant communities in the Western United States. This work (Bourgeron and Engelking 1994) was used as the basis for identifying rare plant communities that occur in the Columbia River Basin.

Results from the summarization of G1 and G2 communities in the Columbia River Basin are found below. Limited information exists on many of these plant communities. The columns in the Appendix table are defined and described as follows:

**Community Name:** The Latin name of the plant community. The Heritage Program uses an existing vegetation classification that is based solely on vegetation attributes (i.e. abiotic features such as soil and precipitation were not used). Although these communities represent vegetation that currently exists on the land, some also approximate a potential vegetation type when found in a very late successional stage. For details on the classification, see Bourgeron and Engelking (1994). For ease of use, communities in this table are organized alphabetically within dominant life forms, and therefore, deviates from the more complex classification hierarchy used by the Heritage Program. As mentioned, there has been a major effort by the Heritage Program to standardize community taxonomy, ensure consistent application of the techniques and concepts, and to quality control data across the Western United States. However, the system is constantly evolving as new information becomes available and the classification is refined.

**G Rank:** Global rank as assigned by the Natural Heritage Program. Only G1 and G2 communities are included. They are defined as, **G1:** Critically imperiled globally because of extreme rarity (5 or fewer occurrences) or because of some factor making it vulnerable to extinction; **G2:** Imperiled globally because of rarity (6 to 20 occurrences) or because other factors demonstrable making it vulnerable to extinction throughout its range.

**Classification Type:** Each community is identified as to whether it is a Plant Association (PA) which is the existing vegetation ; Potential Vegetation Type (PV), the site climax community; or Community Type (CT) which would dominate a site if there were no disturbance.

**Rarity Class:** Each community was assigned a rarity class, if known. They are defined as, **I - Intrinsically rare:** those communities that are naturally restricted due to a unique set of environmental attributes, **M - Managed Rare:** those communities that are rare as a result of human caused activities, and **B - Both:** intrinsically rare communities that are also affected by management.

**Threats:** Existing and potential activities known to threaten these communities are identified below:

AG	Agricultural Conversion	HC	Hydrological Regime Changes
BR	Blister Rust	MN	Mining
CI	Climax Invasion	MT	Mistletoe
DV	Development	OV	Off Highway Vehicles
EX	Exotic Plant Species	PA	Pathogens
FC	Fire, Change in Native Regime	PL	Pipelines
FF	Fire Suppression Activities	RC	Recreation
FI	Fire, Increased Frequency	RD	Road Construction
FR	Fire, In General or Nonspecific	RM	Road Maintenance
FS	Fire, Stand Replacing	RP	Riparian Disturbances
FX	Fire Exclusion	SC	Status Change
GI	Livestock Grazing, Indirect Effects	TH	Timber Harvest
GZ	Livestock Grazing	XX	Herbicide Spray and Drift

**Trend:** Where possible, a trend in community viability was assessed. Trend was categorized as, **I - Increasing; D - Decreasing; S - Stable; U - Unknown.**

**Distribution Across the Columbia River Basin:** Panel members and Heritage Program ecologists identified if a community is known to occur within the Vascular Plant Analysis Areas. Areas were coded as:

**Mont** - Montana  
**NID** - Idaho/North  
**SID** - Idaho/South  
**Wyo** - Wyoming

**Blue** - Blue Mountains  
**NC** - East Cascades North  
**SC/L** - East Cascades South and the High Lava Plains  
**Colu** - Columbia Basin  
**Okan** - Okanogan Highlands  
**OrBa** - Oregon Basin and Range and Owyhee Upland

Typically, these communities occupy small acreages on the land which precludes many types of quantitative analyses at a broad spacial scale. Furthermore, very few of these communities are mapped so even with a smaller scale assessment, analysis based on spacial information would be limited. However, some general trends and patterns can be assessed qualitatively.

**Reference** numbers cited in the table use the same numbers as those in the following documents that were used for the compilation of this section:

Langner, Linda L. 1994. Biological diversity: Status and trends in the United States. U.S.D.A. Forest Service. Gen. Tech. Rep. RM-244. 24 pp.

Bourgeron, P.S. and L.D. Engelking. eds. 1994. A preliminary vegetation classification of the Western United States. Unpublished report prepared by the Western Heritage Task Force for the Nature Conservancy, Boulder, CO

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	Or/Ba	References
	ALPINE COMMUNITIES																
A	<i>Carex aperta</i>	G2	PA	I		U	X					X			X		1197
A	<i>Carex scirpoides</i> - <i>Potentilla diversifolia</i>	G2	PV	B	GZ	D	X										1236
A	<i>Cassiope mertensiana</i> / <i>Carex paysonis</i>	G2	PV	I		S	X										1236
A	<i>Ivesia gordonii</i> - <i>Arenaria obtusiloba</i>	G2	PV			S			X								2
A	<i>Ivesia gordonii</i> - <i>Eriogonum caespitosum</i>	G2	PV	I		S			X								2
A	<i>Ivesia gordonii</i> - <i>Minuartia obtusiloba</i>	G2	PV			S			X								2
A	<i>Salix arctica</i> / <i>Caltha leptosepala</i>	G2G3															1122
A	<i>Salix arctica</i> / <i>Polygonum bistortoides</i>	G2	PA	I	GZ,HC	S	X										1236
A	<i>Salix reticulata</i> / <i>Caltha leptosepala</i>	G2	PV	I	GZ,HC	S	X										1236
	FOREST AND WOODLAND COMMUNITIES																
F	<i>Abies concolor</i> - <i>Calocedrus decurrens</i> - <i>Pinus ponderosa</i> / <i>Amelanchier alnifolia</i>	G2	PA	M	TH,FF	D							X				825
F	<i>Abies concolor</i> - <i>Pinus lambertiana</i> - <i>Pinus ponderosa</i> / <i>Arctostaphylos patula</i>	G2	PV	M	TH,FF	D							X				825
F	<i>Abies grandis</i> - <i>Thuja plicata</i> / <i>Achlys triphylla</i>	G2	PV	B	TH	D						X					148
F	<i>Abies grandis</i> / <i>Arctostaphylos nevadensis</i>	G2	PV	B	TH,FF	U						X					123, 156
F	<i>Abies grandis</i> / <i>Athyrium filix-femina</i>	G2	PV	B	TH,FS	U	X										1197

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
F	<i>Abies grandis/Castinopsis chrysophylla</i>	G2	PV	I	TH,FS	U							X				148
F	<i>Abies grandis/Coptis occidentalis</i>	G2	PV	I	TH,FS	S					X						124, 1185
F	<i>Abies grandis/Taxus brevifolia</i>	G2	PV	B	TH,FS	D		X			X				X		124
F	<i>Abies grandis/Vaccinium caespitosum</i>	G2	PV	I				X									145, 1185, 1190
F	<i>Acer grandidentatum/Calamagrostis rubescens</i>	G2	PV	I					X								1329
F	<i>Juniperus occidentalis/Artemisia arbuscula/Danthonia unispicata-Poa secunda</i>	G2	PV	I	GZ	S										X	1244
F	<i>Juniperus occidentalis/Artemisia rigida/Poa secunda</i>	G2	PV	I		S					X					X	113, 1244
F	<i>Juniperus occidentalis/Artemisia tridentata/Carex filifolia</i>	G1	PV	M	GZ	D							X				820
F	<i>Juniperus occidentalis/Cercocarpus ledifolius/Carex geyeri</i>	G2		B	GZ						X		X				1179
F	<i>Juniperus occidentalis/Cercocarpus ledifolius/Leymus cinereus</i>	G1		B	GZ	D										X	12
F	<i>Juniperus occidentalis/Cercocarpus ledifolius/Symphoricarpos oreophilus</i>	G2	PV	I	SC	S			X							X	12
F	<i>Juniperus occidentalis/Festuca idahoensis</i>	G2?	PV	M	SC, GZ, FX											X	113, 818, 1258
F	<i>Juniperus osteosperma/Leymus ambiguus</i>	G1	PV	I		S			X								1229

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
F	<i>Juniperus osteosperma</i> /Purshia tridentata-Symportocarpos oreophilus/PSESPI	G1	PV	I		S			X								639, 1339
F	<i>Juniperus osteosperma</i> /Stipa comata	G1	PV	I		S			X								1229
F	<i>Picea engelmannii</i> /Carex disperma	G2	PV	I	HC	D			X								25, 163, 1185
F	<i>Picea engelmannii</i> /Hypnum revolutum	G2	PV	I		S			X								25, 163, 1185
F	<i>Picea engelmannii</i> /Physocarpus malvaceus	G2	PV	I	FS	S											25, 163
F	<i>Picea</i> spp./Lysichiton americanum	G2	PV	I	HC	D	X										1197
F	<i>Pinus contorta</i> -( <i>Populus tremuloides</i> )/ <i>Spirea douglasii</i> /Carex spp.	G2											X				610
F	<i>Pinus contorta</i> /Elymus glaucus	G2											X				113
F	<i>Pinus flexilis</i> /Pentaphylloides floribunda/Distichlis stricta	G1Q		I	GZA G,DV	D											1044
F	<i>Pinus flexilis</i> /Potentilla fruticosa/Distichlis stricta	G1Q							X								1044
F	<i>Pinus flexilis</i> /Purshia tridentata	G1	PV	I		S			X								10, 11, 1340
F	<i>Pinus monophylla</i> - <i>Juniperus osteosperma</i> /Artemisia tridentata ssp. vaseyana/PSESPI	G1	PV	I		S			X								1075, 1228
F	<i>Pinus monophylla</i> - <i>Juniperus osteosperma</i> /Cercocarpus ledifolius/PSESPI	G1	PV	I		S			X								1075
F	<i>Pinus monophylla</i> - <i>Juniperus osteosperma</i> /Leymus cinereus	G1	PV	B	GZ, RC				X								1075

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
F	<i>Pinus monophylla</i> - <i>Juniperus osteosperma</i> / <i>Prunus virginiana</i>	G1	PV	B	GZ, RC	S			X								1075
F	<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i>	G1										X					1316
F	<i>Pinus ponderosa</i> - <i>Pseudotsuga menziesii</i> / <i>Arctostaphylos nevadensis</i>	G2	PA		TH,FC	D							X				148, 830
F	<i>Pinus ponderosa</i> - <i>Quercus garryana</i> / <i>Arctostaphylos viscida</i> / <i>Festuca californica</i>	G1	PA		TH,D V,FC	D											1276
F	<i>Pinus ponderosa</i> - <i>Quercus garryana</i> / <i>Balsamorhiza sagittata</i>	G2	PA	M	FC,TH	D							X				148
F	<i>Pinus ponderosa</i> / <i>Amelanchier alnifolia</i>	G2		I	FR	U							X				
F	<i>Pinus ponderosa</i> / <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Poa nervosa</i>	G2	PV	B									X				825
F	<i>Pinus ponderosa</i> / <i>Artemisia tridentata</i> / <i>Stipa</i> spp.	G1		B									X				825
F	<i>Pinus ponderosa</i> / <i>Aspidotis densa</i>	G1										X					156
F	<i>Pinus ponderosa</i> / <i>Calamagrostis rubescens</i>	G2	PV	B	FX,GZ ,TH	D		X			X	X	X	X			9, 110, 113, 136, 140, 1275
F	<i>Pinus ponderosa</i> / <i>Crateagus douglasii</i>	G1	PV	I	AG,D V,TH, GZ,RP	D		X			X						1254, 1276
F	<i>Pinus ponderosa</i> / <i>Elymus glaucus</i>	G2	PA	B	FC,FX, RD	D					X						113, 837

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
F	<i>Pinus ponderosa</i> /Physocarpus malvaceus	G2	PV	B	FX,FC, TH,EX	D		X						X			7, 9, 95, 110, 113, 134, 145, 970, 1185, 1267
F	<i>Pinus ponderosa</i> /Purshia tridentata/Oryzopsis hymenoides	G1	PA	B		S						X	X			X	94, 1258
F	<i>Pinus ponderosa</i> /Purshia tridentata/Stipa occidentalis	G2	PA	I		S							X				822, 826
F	<i>Pinus ponderosa</i> /Spiraea betulifolia	G2	PV	M	FX,TH	D	X	X			X?						163, 626, 761, 808
F	<i>Pinus ponderosa</i> /Stipa comata	G1	PA	I		S									X	X?	7, 9, 110, 149, 1185
F	<i>Pinus ponderosa</i> /Wyethia mollis	G2	PA	B	FX,GZ, TH	D					X		X				825
F	<i>Pseudotsuga menziesii</i> /Pachystima myrsinites	G2G3	PV	M	TH,FC	D					X	X					7, 142, 144, 162, 169, 207, 1116
F	<i>Pseudotsuga menziesii</i> /Purshia tridentata	G2	PA	B	FX,EX	D	X										MNHP
F	<i>Pseudotsuga menziesii</i> /Rosa gymnocarpa/Holodiscus discolor	G2										X					116, 151
F	<i>Pseudotsuga menziesii</i> /Symphoricarpos albus/Holodiscus discolor	G1										X					102, 110, 1267
F	<i>Thuja plicata</i> /Achlys triphylla	G2	PV	B	TH	D						X					152
F	<i>Thuja plicata</i> /Adiantum pedatum	G2	PV	B	TH,RC	D			X								95
F	<i>Thuja plicata</i> /Aralia nudicaulis	G2	PV	B	TH	D		X									145, 1190
F	<i>Thuja plicata</i> /Linnaea borealis	G2	PV	B	TH	D											834, 1270

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
F	<i>Tsuga heterophylla</i> /Athyrium filix-femina	G2	PV	I	TH	D		X									95, 1345, 1346
F	<i>Tsuga heterophylla</i> /Lysichiton americanum	G2		I				X				X					24, 93, 110, 116, 128, 151, 153, 831, 1213, 1274
F	<i>Tsuga heterophylla</i> /Menziesia ferruginea	G2	PV	B				X				X					95, 1190
F	<i>Tsuga heterophylla</i> /Rhododendron albiflorum	G1	PV	I				X									145
F	<i>Tsuga heterophylla</i> /Xerophyllum tenax	G2	PV	I	TH	D		X				X					95, 110, 116, 145, 151, 1190
F	<i>Tsuga mertensiana</i> /Caltha biflora	G2		B								X					118, 153, 1213
F	<i>Tsuga mertensiana</i> /Oplopanax horridum	G2										X					118, 119, 153, 1213
F	<i>Tsuga mertensiana</i> /Streptopus amplexifolius	G2	PV	B	HC,TH	D		X									95
	SHRUB STEPPE AND GRASSLAND COMMUNITIES																
S / G	<i>Agropyron dasystachyum</i> -Stipa comata	G1	PA	B	EX,A G,GZ	D								X			850, 860
S / G	<i>Agropyron spicatum</i> /Eriogonum ovalifolium	G1	PA	I	GZ,D V	D	X										MNHP
S / G	<i>Agrostis exarata</i> - <i>Agrostis scabra</i>	G2															29, 30

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	<i>Allenrolfea occidentalis</i>	G2	PV	B	GZ	S										X	1245, 1276
S / G	<i>Amelanchier alnifolia</i>	G2															877
S / G	<i>Arctostaphylos viscida</i> - <i>Ceanothus cuneatus</i> / <i>Festuca idahoensis</i> - <i>Stipa lemmonii</i>	G2	PA	M	FF,FI, GZ,GI	D											830, 1276
S / G	<i>Aristida longiseta</i> / <i>Sporobolus cryptandrus</i>	G2		B	HC	D								X	X	X	124
S / G	<i>Artemisia arbuscula</i> ssp. <i>thermopola</i> / <i>Festuca idahoensis</i>	G2	PV	B	DV,G Z	D		X	X					X			15, 23
S / G	<i>Artemisia arbuscula</i> / <i>Leymus ambiguus</i>	G1G2	PV	I		S			X								1229
S / G	<i>Artemisia cana</i> ssp. <i>viscidula</i> / <i>Deschampsia cespitosa</i>	G2G3	PV	M	OZ	D							X			X	685, 1052, 1134
S / G	<i>Artemisia cana</i> - <i>Artemisia tridentata</i> ssp. <i>vasiyana</i> / <i>Poa cusickii</i>	G2	PV	B	GZ	S							X			X	1276
S / G	<i>Artemisia cana</i> /( <i>Elymus caninus</i> )- <i>Poa nevadensis</i>	G1	PV	M		D							X				1276, 1306
S / G	<i>Artemisia cana</i> / <i>Carex nebrascensis</i> - <i>Poa cusickii</i>	G2	PV	M	OZ	D					X		X			X	610, 1050, 1307

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	<i>Artemisia cana</i> /Leymus cinereus	G1	PV	M	GZ	D										X	1276
S / G	<i>Artemisia nova</i> /Leymus ambiguus	G1G2	PV	I													1332
S / G	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> /Hilaria jamesii	G2G4															41, 366, 528, 994, 1019, 1049
S / G	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> /Leymus cinereus	G2G3	PV	M	GZ,A G,FR	D			X							X	228, 284
S / G	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> /Pascopyrum smithii	G2G3	PV	M	GZ,FR	D											272, 273, 274, 325
S / G	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> /Pseudoroegneria spicata- <i>Poa secunda</i>	G1	PV	M		D								X			1276
S / G	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> /Stipa comata	G2	PV	B	DV,G Z,AG	D			X		X		X	X	X	X	ONHP
S / G	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Cercocarpus ledifolius</i> /Elymus <i>caninus</i> -POASEC	G1	PV	I	GZ	D										X	12
S / G	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> /Stipa occidentalis	G2	PV	B		D							X				1179, 1276
S / G	<i>Artemisia tridentata</i> ssp. <i>wyo.</i> - <i>Peraphyllum ramosissimum</i> /Festuca <i>idahoensis</i>	G2	PV	B	GZ	U					X		X			X	1276

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	<i>Artemisia tridentata</i> ssp. <i>wyo./Carex filifolia</i>	G1Q											X				1336
S / G	<i>Artemisia tridentata</i> ssp. <i>wyomingensis/Stipa comata</i>	G2	PV	M		D										X	15, 1230, 1336
S / G	<i>Artemisia tridentata-Atriplex canescens-Sarcobatus vermiculatus</i> (ORYHYM)	G2	PA	M	GZ	D										X	827
S / G	<i>Artemisia tridentata-Purshia tridentata/Oryzopsis hymenoides-Stipa comata</i>	G1	PV	B		D								X		X	835, 850
S / G	<i>Artemisia tridentata/Leymus cinereus</i>	G2G4	PV	I	GZ	D			X								1143, 1157, 1193, 904, 1077, 1094, 1095
S / G	<i>Artemisia tripartita/Festuca scabrella</i>	G2	PV	B	GZ	D								X			12 67
S / G	<i>Artemisia tripartita/Stipa comata</i>	G1	PV	B										X			8, 15, 134, 1267
S / G	<i>Atriplex confertifolia/Leymus ambiguus</i>	G2	PV	I		S			X								1229
S / G	<i>Atriplex confertifolia/Oryzopsis hymenoides</i>	G2	PV	M	SC,GZ	S/U			X							X	228, 229, 325, 372, 1332, 1093, 1096, 1138
S / G	<i>Calamagrostis purpurascens</i>	G2	PV	M	GZ	S			X								103

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	Carex stenophylla/Poa secunda	G2	PV	I		S			X								1337
S / G	Cercocarpus ledifolius/Calamagrostis rubescens	G2	PV	I	GZ,X X	D		X								X	12
S / G	Cercocarpus ledifolius/Festuca idahoensis	G2	PV	B	GZ,FI	D	X				X						12, 113, 1235
S / G	Cercocarpus ledifolius/Holodiscus dumosus	G1	PV	I		U			X								1343
S / G	Cercocarpus ledifolius/Leymus ambiguus	G2	PV	I	SC	U			X								1343
S / G	Cercocarpus ledifolius/Pseudoroegneria spicata- Festuca idahoensis	G2	PV	B	GZ,FI	S									X	X	12
S / G	Cercocarpus ledifolius/Symphoricarpos oreophilus	G2	PV	B	SC,GZ	D			X						X	X	12
S / G	Chrysothamnus nauseosus/Leymus flavescens/Psoraleum lanceolatum	G1	PV	I		S			X								4
S / G	Danthonia californica (valley grassland)	G1	PV	M	AG,G Z,FR	D											816, 845, 855, 876
S / G	Danthonia californica-Festuca idahoensis	G1Q	PV	M	AG,D V,GZ	D											862, 1289

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	Danthonia intermedia	G2G3										X					103, 162, 222, 347, 1020, 1134
S / G	Elymus flavescens	G2	PV	I		S			X								4
S / G	Elymus glaucus	G2															1308
S / G	Eriogonum ovalifolium var. depressum	G1	PV	I		S			X								10, 11
S / G	Festuca idahoensis-Carex scirpoides	G2	PV	B	GZ	D	X										326
S / G	Festuca idahoensis-Eriogonum caespitosum	G2	PV	I													2
S / G	Festuca idahoensis-Eriogonum heracleoides	G2	PV	M								X		X			8, 134, 1266, 1319
S / G	Festuca idahoensis-Festuca kingii	G2?	PV	B		D	X		X								1259
S / G	Festuca idahoensis-Hieracium cynoglossoides	G2	PV	B	GZ,EX	D							X	X			8
S / G	Festuca idahoensis-Symphoricarpos albus	G2	PA	M	FX,AG ,GZ	D					X						8, 141, 1252

F	L	Community name		G	Rank	Class Type	Class	R	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References	
S	S	Festuca viridula-Festuca idahoensis		G2		PV	I	G2	D			X			X							124
S	S	Festuca viridula-Lupinus latifolius		G2		PV	B	G2	S						X							96, 103, 114, 117, 122, 124, 141, 842, 1252, 1256, 1318
S	S	Grayia spinesa-Sarcobatus vermiculatus/Coryzopsis hymenoides)		G2		PV	I	G2, EX	U											X		817
S	S	Leymus ambiguum-Encelhiopsis nudicaulis		G2		PV	I		S			X										1343
S	S	Leymus ambiguum-Lupinus argenteus		G2		PV	B	G2	S			X										1343
S	S	Leymus cinereus-Distichlis stricta		G1		PV	B	G2, A	S			X								X		8, 110
S	S	Leymus cinereus-bottomlands		G1		PV	M	G2, A	D						X		X		X			8, 817, 835, 1252, 1298
S	S	Leymus flavescens		G2																		4
S	S	Leymus triticoides-Poa secunda		G2		PV	M	G2, A	D											X		1292
S	/	Poa cuscuta		G2		PV	M	G2, A	D								X					610

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	<i>Poa nevadensis</i> - <i>Puccinellia lemmonii</i> - <i>Elymus elymoides</i>	G1	PV	B	GZ						X		X			X	859, 1289
S / G	<i>Pseudoroegneria spicata</i> - <i>Aristida longiseta</i> - <i>Sporobolus cryptandrus</i>	G2	PV	I	GZ	S					X	X					24, Wootton report
S / G	<i>Pseudoroegneria spicata</i> - <i>Eriogonum heracleoides</i>	G1?	PV	B	GZ	S		X					X				852, 252
S / G	<i>Pseudoroegneria spicata</i> - <i>Festuca idahoensis</i> (Palouse)	G1?	PV	M	DV,A G	D		X			X			X			8, 113, 124, 141, 813, 835, 1179
S / G	<i>Purshia tridentata</i> - <i>Artemisia tridentata</i> ssp. <i>tridentata</i>	G1											X				4
S / G	<i>Purshia tridentata</i> -( <i>Pseudoroegneria spicata</i> )- <i>Festuca idahoensis</i>	G1	PA	B	MN,F X	D			X		X	X		X			1179
S / G	<i>Purshia tridentata</i> - <i>Carex pensylvanica</i> - <i>Stipa occidentalis</i>	G1	PV	B	MN,G Z	S							X				822
S / G	<i>Purshia tridentata</i> - <i>Chrysothamnus nauseosus</i>	G1	PV	B		S		X	X								4
S / G	<i>Purshia tridentata</i> - <i>Oryzopsis hymenoides</i>	G1	PV	B	AG,G Z	D			X			X		X		X	8, 1233, 1267
S / G	<i>Purshia tridentata</i> - <i>Poa nevadensis</i>	G1?															1344

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	<i>Purshia tridentata</i> / <i>Prunus virginiana</i>	G1?	PV	B	FX,SC			X	X								1330
S / G	<i>Purshia tridentata</i> / <i>Pseudotsuga spicata</i> - <i>Leymus cinereus</i>	G1		M					X								11
S / G	<i>Purshia tridentata</i> / <i>Stipa comata</i>	G2	PV	B	FR, GZ, DV				X			X		X			8, 835, 1266
S / G	<i>Quercus garryana</i> / <i>Carex geyeri</i>	G2															156
S / G	<i>Quercus garryana</i> / <i>Ceanothus cuneatus</i> / <i>Festuca idahoensis</i>	G2	PA	M	AG,D V,GZ, FX	D											1288
S / G	<i>Quercus garryana</i> / <i>Elymus glaucus</i>	G2	PA	M	AG,D V,GZ, FX	D											123
S / G	<i>Quercus garryana</i> / <i>Festuca idahoensis</i>	G1	PV	M	FX,TH ,GZ	D						X	X				123
S / G	<i>Quercus garryana</i> / <i>Rhus diversiloba</i> - <i>Symphoricarpos albus</i> / <i>Elymus glaucus</i>	G2	PA	M	FX,GZ ,TH,D V	D											1276, 1303
S / G	<i>Rhus aromatica</i> - <i>Salix exigua</i>	G2															1225
S / G	<i>Rosa nutkana</i> / <i>Festuca idahoensis</i>	G2G3	PV	B	DV, AG	U		X			X			X			8, 1252

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
S / G	<i>Salicornia rubra</i>	G2	CT	B	AG,G Z	U			X								497, 521, 1197
S / G	<i>Sphaeromeria argentea</i> - <i>Artemisia frigida</i> - <i>Poa secunda</i>	G2															1337
S / G	<i>Sphaeromeria argentea</i> - <i>Oryzopsis swallenii</i>	G2															1337
S / G	<i>Sporobolus cryptandrus</i>	G2	PA	M	RP,HC ,GZ	D					X						109
S / G	<i>Sporobolus cryptandrus</i> - <i>Poa secunda</i>	G2												X	X	X	8, 141, 1252
S / G	<i>Tanacetum nuttallii</i> / <i>Artemisia frigida</i> / <i>Poa secunda</i>	G2	PV	M	GZ	S			X								1337
S / G	<i>Tanacetum nuttallii</i> / <i>Oryzopsis swallenii</i>	G2	PV	B	GZ	S			X								1337
	WETLAND AND RIPARIAN COMMUNITIES																
W	<i>Acer negundo</i> / <i>Equisetum arvense</i>	G2?															1134
W	<i>Alnus incana</i> - <i>Betula occidentalis</i>	G1	CT	B	GZ,HC ,AG	D					X		X			X	1304, 1305
W	<i>Alnus incana</i> - <i>Populus tremuloides</i> / <i>Betula glandulosa</i> - <i>Ribes</i> / <i>Carex</i>	G1	CT	M	DV	D					X						1253

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	Or/Ba	References
W	<i>Alnus incana</i> - <i>Populus tremuloides</i> / <i>Cornus stolonifera</i>	G1	CT	M	GZ,HC,AG	D					X		X			X	1241
W	<i>Alnus incana</i> - <i>Populus trichocarpa</i> /( <i>Salix</i> ) <i>Carex</i> spp.	G1	CT	B	GZ	D							X			X	610
W	<i>Alnus incana</i> / <i>Spiraea douglasii</i>	G2	CT	I	GZ	U					X		X				610
W	<i>Alnus incana</i> / <i>Symphoricarpos albus</i>	G2	CT	M	GZ,AG	D						X				X	610, 1050, 1254, 1255
W	<i>Alnus incana</i> /mesic forb	G2G3	PV	M		U			X		X		X				1052, 1134
W	<i>Alnus incana</i> /mesic graminoid ( <i>Carex</i> )	G2G3	PV	M		S-D			X		X		X			X	1134
W	<i>Alnus rhombifolia</i> / <i>Abies grandis</i>	G2	PV	B	GZ,TH	D		X									17
W	<i>Alnus rhombifolia</i> / <i>Betula occidentalis</i>	G1	PV	B	GZ	U		X									17
W	<i>Alnus rhombifolia</i> / <i>Celtis reticulata</i>	G2	PV	B		U		X			X						17
W	<i>Alnus rhombifolia</i> / <i>Philadelphus lewisii</i>	G1	PV	B	GZ, RD	U		X			X						17
W	<i>Alnus rhombifolia</i> / <i>Prunus virginiana</i>	G2	PV	B		U		X									17
W	<i>Alnus rhombifolia</i> / <i>Rosa woodsii</i>	G1	PV	B		U		X			X						17
W	<i>Alnus rhombifolia</i> / <i>Sambucus cerulea</i>	G2	PV	B	GZ	U											17
W	<i>Alnus sinuata</i>	G2?	CT	I	none	S	X					X					1197
W	<i>Betula occidentalis</i> / <i>Crataegus douglasii</i>	G2	PV	B	GZ	D		X			X		X				1276
W	<i>Betula occidentalis</i> / <i>Populus trichocarpa</i> / <i>Salix</i>	G2									X		X				150, 1306,
W	<i>Betula occidentalis</i> / <i>Purshia tridentata</i> / <i>Stipa comata</i>	G1															1344

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
W	<i>Betula occidentalis</i> /mesic forb	G2G3	PV	M	GZ, RD	D			X								1134
W	<i>Carex praegracilis</i> - <i>Carex aquatilis</i>	G2G3	PV	M		U			X								1219
W	<i>Crataegus douglasii</i>	G2	PV	I	HC, GZ	U	X										950
W	<i>Crataegus douglasii</i> /Heracleum lanatum	G2	PV	B	BN			X						X			8
W	<i>Crataegus douglasii</i> /Rosa woodsii	G2	PV	M	AG			X			X			X			610, 1276
W	<i>Deschampsia cespitosa</i> - <i>Carex</i> /alkaline bottomland	G2	PV	M	DV, GZ	D					X					X	ONHP
W	<i>Eleocharis palustris</i> - <i>Distichlis spicata</i>	G2G4	PV	M	AG, GZ	D										X	1100
W	<i>Eleocharis palustris</i> - <i>Juncus balticus</i>	G2G4	PV	M	AG, GZ	D										X	1141
W	<i>Juncus balticus</i> - <i>Carex rossii</i>	G2G4															1187
W	<i>Populus angustifolia</i> /Acer grandidentatum	G2G3															1134
W	<i>Populus tremuloides</i> - <i>Abies lasiocarpa</i> /Shepherdia canadensis	G2?		M					X								266, 810
W	<i>Populus tremuloides</i> /Carex spp.	G2		B	FX, GZ, EX											X	610, 1311
W	<i>Populus tremuloides</i> /Rubus parviflorus	G2?	PV	B	GZ				X								266
W	<i>Populus tremuloides</i> /Symphoricarpos albus/Ellymus glaucus	G2	PA	B	FX, GZ, EX							X				X	610, 1311
W	<i>Populus trichocarpa</i> /Cicuta douglasii	G1	PV	B										X			8
W	<i>Populus trichocarpa</i> /Crataegus douglasii	G1	PV	B	GZ, HC	D		X		X							1254, 1255

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
W	<i>Populus trichocarpa</i> / <i>Salix exigua</i>	G1	PA		GZ,RP					X			X			X	835, 1306
W	<i>Salix amygdaloides</i> - <i>Salix exigua</i> - <i>Salix lasiandra</i>	G1	PA	M	GZ,RP	D					X			X		X	1249
W	<i>Salix amygdaloides</i> - <i>Salix fluviatilis</i> - <i>Salix lasiandra</i> / <i>Carex</i> spp.	G1	PA	I	GZ,RP	D					X						1249
W	<i>Salix boothii</i> - <i>Salix geyeriana</i>	G2	PA	M	GZ,RP	D										X	610
W	<i>Salix boothii</i> - <i>Salix geyeriana</i> / <i>Carex eurycarpa</i>	G2	PA	M	GZ,RP	D							X				610
W	<i>Salix boothii</i> - <i>Salix lemmonii</i>	G2	PA	M	GZ,RP	D					X		X				610, 1306
W	<i>Salix boothii</i> / <i>Carex aquatilis</i>	G2G3	PV	I	GZ,RP	D		X			X		X				31, 1052, 1084
W	<i>Salix boothii</i> / <i>Poa palustris</i>	G1	PV	I		U		X									31, 1134
W	<i>Salix drummondiana</i> / <i>Calamagrostis canadensis</i>	G2	CT	I		U		X	X								30, 163, 191, 221, 322
W	<i>Salix eastwoodiae</i>	G1															31
W	<i>Salix eastwoodiae</i> / <i>Carex aquatilis</i>	G2	PV	M	GZ			X									686
W	<i>Salix eastwoodiae</i> / <i>Carex rostrata</i>	G2	PV	M	GZ			X									686
W	<i>Salix exigua</i> - <i>Salix lasiandra</i>	G1	PA	M	GZ,RP	D					X		X	X		X	1312
W	<i>Salix exigua</i> / <i>mesic forb</i>	G2Q	PV	M	GZ							X				X	1052, 1134
W	<i>Salix geyeriana</i> - <i>Salix lemmonii</i>	G2	PA	M	GZ,RP	D					X						610
W	<i>Salix geyeriana</i> / <i>Poa palustris</i>	G2	PV	M	GZ	U			X								31, 686, 1134
W	<i>Salix geyeriana</i> / <i>mesic graminoid</i>	G2G3	PV	M	GZ	U			X								31, 1052, 1134
W	<i>Salix lasiolepis</i> / <i>barren</i>	G2Q															1134

L F	Community name	G Rank	Class Type	R Class	Threats	Trend	Mont	NID	SID	Wyo	Blue	NC	SC/L	Colu	Okan	OrBa	References
W	Salix planifolia	G2															31
W	Salix wolfii/Carex nebraskensis	G2	PV	M	GZ	U			X	X							31
W	Salix wolfii/Poa palustris	G2	PV	I		U		X									31
W	Salix wolfii/Swertia perennis- Pedicularis groenlandica	G2	PV	M	GZ	S		X									29, 30
W	Scirpus americanus	G1Q	PV	I		U			X							X	29
W	Scirpus cespitosus/Carex livida	G1	PV	I		S		X									29
W	Scirpus pungens	G2G4	PV	I	HC	S											1197, 1219
W	Senecio triangularis	G2?									X		X				347, 1197

## APPENDIX 5

### Plants of Cultural Importance

**Culturally Significant Plants  
Interior Columbia Basin Ecosystem Management Project**

July 10, 1995

Report Prepared by:  
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### **Species Selected For Inclusion**

This list of species should not be considered to be a complete list of all species that are used by Indian peoples of the project area. It is apparent that there was formally much wider recognition and utilization of the native flora than there is currently. Elders stress that at one time all plants had a name and a recognized use. But even today there remains hundreds of plant species that continue to be utilized, some only by individual groups or families but others are recognized as being integral to continuing cultural practices and tribal tradition.

It would have been an unwieldy task to attempt to analyze all of the many hundreds of species for which there are recorded purposes, particularly the many that have purported but uncorroborated medicinal uses. Therefore, the decision was made to attempt to narrow the analysis to those species which are currently considered to be the most important to the seventeen tribal groups whose area of interest lies within the project area. Some of these species are very local in use and or occurrence, while others are more widespread. There are some species whose primary range and use is outside of the project area but are important enough to one or more of the tribes to warrant inclusion.

### **Native Taxonomy**

The area encompassing this project includes the area of interest of tribes who speak many languages included within five major language families. These are Sahaptin, Interior Salish, Lutuami, Chinookin, and the Numic group of Uto-Aztecan family. many of these languages include use of sounds that are not used in the English language but more importantly they include concepts for plants and their relationship to the environment and culture which do not translate directly into English.

The plants are listed by scientific name for the purpose of being consistent with and thereby useable with the rest of the ICBEMP analysis being conducted by the Project. However, it is important to recognize that not everything that goes by a certain name by a plant taxonomist would be equally recognized by an Indian elder. *Lomatium nudicaule* would be one example of this. In spring when the first sprouts appear, this plant is called "*pt'ishpt'ish*" in Warm Springs Sahaptin, which refers to the edible first leaves. Mature plants with a stout stem are referred to

as "*xamsi*" which has an edible stem while other plants with a narrow, spindly, stem are called "*ashwaniya*" which means "slave to xamsi" (from a story) and is not eaten. These are not names for stages of growth, strictly speaking; these are individual plant names.

Taxonomy is further complicated by local differences in what one tribal group prefers relative to another and also differences within a taxa across its range. For instance, *Lomatium piperi* and *L. gormanii* are two closely related species that are often mistaken for one another. However in Central Washington members of the Yakama tribe readily distinguish between the two. *L. piperi* is recognized as edible while *L. gormanii* is eschewed as "groundhog food". However in southern Oregon, *L. gormanii*, is considered to be quite palatable (L. Houseley, personal communication).

### Summary of Information Presented

The table of information presented in Appendix 5 has been organized into three main cultural areas. There are three fields for each of these areas, with either a "1" to represent primary use, a "2" to represent a species with less important or localized use, and a blank to represent that it was essentially not used by that group. The habitat types that these taxa occur in, is in the following column. The codes used are the same as those used in the ICBEMP analysis and are explained on pages 79-81, Tables 3-4, of the main body of the document.

### Management of Plant Populations

Finally, it must be noted that management of culturally significant plants is not a question of maintaining species viability but rather it is imperative that species harvestability be maintained. For the most part, these are not rare species. Most of these taxa are at least locally abundant somewhere. Small, isolated or difficult to harvest populations may have no bearing. It is generally the large, healthy, accessible populations that Federal agencies must manage consistently to insure continued harvestability of these species.

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SCIENTIFIC NAME	COLUMBIA PLATEAU	PAIUTE- SHOSHONE	KLAMATH- MODOC	VEGTYPE	SERAL STAGE
<i>Allium acuminatum</i>	2	2	2	CRBS01, CRBS03, CRBS08, SRM104, CRBS04, SRM402, SRM406, SAF237, SAF245	OF:SS, SE:OC, SI
<i>Allium spp.</i>	2	2	2	CRBS01, CRBS03, CRBS08, SRM104, CRBS04, SRM402, SRM406, SAF237, SAF245	
<i>Alnus incana</i>	2	2	2	CRBS05	
<i>Amelanchier alnifolia</i>	2	2	2	CRBS02, SRM421, CRBS09, SAF210, SAF237, SAF243, SAF245, CRB003	OF:SS, SE:OC, SI
<i>Apocynum cannabinum</i>	1	1	2	CRBS07, CRBS06	
<i>Arctostaphylos nevadensis</i>	2	2	2	CRBS02, SAF210, SAF218, SAF243, SAF245, CRB003, SAF237	OF:SS, SE:OC, SI
<i>Arctostaphylos uva-ursi</i>	2	2	2	CRBS02, SAF210, SAF218, SAF237, CRB003	OF:SS, SE:OC, SI
<i>Artemisia tridentata</i>	2	2	2	CRBS03, CRBS04, SRM402	
<i>Atriplex confertifolia</i>		2		CRBS05, SRM414	
<i>Balsamorhiza hookeri</i>		2		CRBS06, SRM406	
<i>Balsamorhiza sagittata</i>	2	2	2	SAF233, CRBS06, CRBS13, CRBS01, CRBS03, SAF237, SAF245	OF:SS, SE:OC, SI
<i>Berberis nervosa</i>	2		2	CRB008, CRBS09, SAF227	UR, YF, OF:MS, OF:SS
<i>Brodiaea grandiflora</i>		2		CRBS07, CRBS06	
<i>Brodiaea hyacinthina</i>	2	2	2	CRBS07, CRBS06	
<i>Bryoria fremontii</i>	1	2	1	CRBS02, SAF237, SAF243, SAF245	OF:MS, OF:SS
<i>Calochortus macrocarpus</i>	2	2	2	CRBS01, CRBS03, CRBS13, SRM104, CRBS04, SRM402, SRM322, SAF237	OF:SS, SE:OC, SI

SCIENTIFIC NAME	COLUMBIA PLATEAU	PAIUTE-SHOSHONE	KLAMATH-MODOC	VEGTYPE	SERAL STAGE
<i>Calochortus nuttalli</i>		2		CRBS01, CRBS03, CRBS06, CRBS13, CRBS04	
<i>Camassia leichtlinii</i>	1			CRB007, CRBS07	
<i>Camassia quamash</i>	1	1	1	CRB007, CRBS07	
<i>Claytonia lanceolata</i>	2			SAF233, CRBS07, CRBS09, SAF206	UR, YF, OF:MS, OF:SS
<i>Cornus stolonifera</i>	2	2	2	CRBS05, SAF235	
<i>Corylus cornuta</i>	2		2	CRBS09, SAF210, SAF233	SI, SE:OC, UR, OF:MS, OF:SS
<i>Crataegus columbiana</i>	2			CRBS05, SAF235	
<i>Crataegus douglasii</i>	2			CRBS05, SAF235	
<i>Elymus cinereus</i>		1		CRBS06, CRBS13, CRBS04	
<i>Fragaria vesca</i>	2	2	2	CRBS09, CRBS11, SAF210, SAF212, SAF215, SAF243	SI, SE:OC, OF:SS
<i>Fragaria virginiana</i>	2	2	2	CRBS09, CRBS02, CRBS11, SAF210, SAF212, SAF218, SAF237, SAF243, SAF245	SI, SE:OC, OF:SS
<i>Fritillaria pudica</i>	2	2	2	CRBS01, CRBS03, SAF233, CRBS06, CRBS13, SRM104, CRBS04, SRM402, SRM406	
<i>Helianthus annuus</i>		2		CRBS03, CRBS06, CRBS04	
<i>Heracleum lanatum</i>	2		2	CRBS05	
<i>Juniperus occidentalis</i>	2	2	2	CRBS01, CRBS03	All
<i>Lewisia rediviva</i>	1	1	1	CRBS06, SRM406	
<i>Ligusticum canbyi</i>	2	2		CRBS05, CRB007, CRBS07, SAF217, SAF235	

SCIENTIFIC NAME	COLUMBIA PLATEAU	PAIUTE- SHOSHONE	KLAMATH- MODOC	VEGTYPE	SERIAL STAGE
<i>Ligusticum grayi</i>	2	2	2	CRBS05, CRB007, CRBS07, SAF217, SAF235	
<i>Lomatium canybi</i>	1	1	2	CRBS06, SRM406	
<i>Lomatium cous</i>	1	1	2	CRBS06, SRM406	
<i>Lomatium dissectum</i>	1	1		CRBS01, CRBS03, SAF233, SRM322, SAF237, SAF210, SAF245	Talus and rocky openings
<i>Lomatium farinosum</i> var. <i>hambleniae</i>	2			CRBS06, SRM406	
<i>Lomatium gormanii</i>			2	CRBS06, SRM406	
<i>Lomatium grayi</i>	1			CRBS01, CRBS03, SAF233, CRBS04, SRM402, SRM406	Rocky openings
<i>Lomatium hendersonii</i>		1		CRBS06, SRM406	
<i>Lomatium macrocarpum</i>	2	2		CRBS06, SRM406	
<i>Lomatium minus</i>	2			CRBS06, SRM406	
<i>Lomatium nudicaule</i>	1	1		CRBS01, CRBS03, SAF233, SRM104, CRBS04, SRM406, SAF237	
<i>Lomatium piperi</i>	2	2		CRBS06, SRM406	
<i>Lomatium suksdorfii</i>	1			CRBS06, CRBS13, SAF233	
<i>Mentha arvensis</i>	2	2	2	CRBS07	
<i>Mentzelia albicaulis</i>		2	2	CRBS03, CRBS06, CRBS04	
<i>Mentzelia laevicaulis</i>		2		CRBS01, CRBS03, CRBS04	
<i>Nicotiana attenuata</i>	2	2	2	CRBS01, CRBS02, CRBS03, CRBS06, CRBS13, CRBS04, SAF237, SAF245	Sometimes cultivated

SCIENTIFIC NAME	COLUMBIA PLATEAU	PAIUTE- SHOSHONE	KLAMATH- MODOC	VEGTYPE	SERAL STAGE
<i>Nuphar polysepalum</i>			1	CRB007, CRBS20	
<i>Orobanche uniflora</i> var. <i>purpurea</i>		2		CRBS06, SRM406	
<i>Oryzopsis hymenoides</i>		1		CRBS01, CRBS03, CRBS06, CRBS13, CRBS04, SRM414	
<i>Perideridia bolanderi</i>		1		CRBS07, CRBS06	
<i>Perideridia erythrorhiza</i>			2	CRBS07, CRBS06	
<i>Perideridia gairdneri</i>	1	1	1	CRBS07, CRBS06	
<i>Perideridia oregana</i>		1	1	CRBS07, CRBS06	
<i>Phragmites communis</i>		2		CRB007, CRBS07	
<i>Pinus albicaulis</i>	2			SAF208	
<i>Pinus monophylla</i>		1		CRBS01, CRBS03	
<i>Pinus ponderosa</i>		2		SAF245	
<i>Prunus subcordata</i>		1	1	CRBS05, SAF235, SAF243, SAF245	
<i>Prunus virginiana</i>	1	1	1	CRBS05, SRM421	
<i>Psoralea esculenta</i>		2		CRBS06, CRBS13	
<i>Quercus garryana</i>	2			SAF233	
<i>Rhizopteris plurijugis</i>		2		CRBS06, SRM406	
<i>Ribes aureum</i>	2	2	2	CRBS05, SAF235	
<i>Rosa nutkana</i>	2	2	2	CRBS05, SRM421, SAF210, SAF237, SAF243, SAF245, CRBS02, CRBS09, SAF235	

SCIENTIFIC NAME	COLUMBIA PLATEAU	PAIUTE- SHOSHONE	KLAMATH- MODOC	VEGTYPE	SERIAL STAGE
<i>Rosa spp.</i>	2	2	2	CRBS05, SRM421, SAF210, SAF237, SAF243, SAF245, CRBS02, CRBS09, SAF235	
<i>Rubus spp.</i>	2	2	2	CRBS02, SAF210, SAF237, SAF243, SAF245, CRBS09, CRBS11, SAF227, CRB003	SI, SE:OC, OF:SS
<i>Sagittaria cuneata</i>	2		2	CRB007, CRBS07	
<i>Sagittaria latifolia</i>	2		2	CRB007, CRBS07	
<i>Salix spp.</i>	1	1	1	CRBS05, SAF235	
<i>Sambucus cerulea</i>	2	2	2	CRBS02, CRBS09, SAF210, SAF243, SAF245, CRB003	
<i>Scirpus acutus</i>	2	2	2	CRB007, CRBS20	
<i>Scirpus validus</i>	2	2	2	CRB007, CRBS20	
<i>Shepherdia argentea</i>		2		CRBS05, SRM414	
<i>Suaeda depressa</i>		2		CRBS05, SRM414	
<i>Tauschia hooveri</i>	2			CRBS06, SRM406	
<i>Typha latifolia</i>	2	2	2	CRB007, CRBS20	
<i>Vaccinium caespitosum</i>	2		2	SAF218, SAF227	SI, SE:OC, OF:SS
<i>Vaccinium deliciosum</i>	2			CRB008, SAF205, SAF206	SI, SE:OC, OF:SS
<i>Vaccinium globulare</i>	1			SAF210, SAF212, SAF218	SI, SE:OC, OF:SS
<i>Vaccinium membranaceum</i>	1	2	1	CRB008, CRBS11, SAF205, SAF218, SAF227	SI, SE:OC, OF:SS
<i>Vaccinium ovalifolium</i>	2		2	CRB008, CRBS11, SAF227	SI, SE:OC, OF:SS
<i>Vaccinium oxycoccus</i>	2			CRBS05, CRB007, CRBS07	
<i>Valeriana edulis</i>		2	2	CRBS07, CRBS06	

## APPENDIX 6

### Research, Development, and Applications Database

## Research, Development, and Application Needs for Rare Vascular Plants within the Interior Columbia Basin

During the vascular plant panel process, it became clear that the lack of knowledge concerning certain areas of species biology and ecology was interfering with the experts' ability to develop accurate assessments and taxa-specific management guidelines and recommendations. Broad, one size fits all, direction for rare plant management has proven to be problematic in many cases. Vague guidelines are often difficult to interpret or implement (and are hence sometimes ignored). To rectify this situation, panel members were encouraged to identify research needs that would specifically improve our ability to manage or protect species of conservation concern. The results of that assignment are summarized in the table that follows.

The Research Needs (RDA) table is divided into three columns. The "Species Name" column contains the Latin binomial for each plant with an identified research need. The "Research Need" column identifies an area of species biology or ecology that the panel felt was necessary to pursue in order to provide specific management recommendations. These needs were compiled over the three days allotted to each panel and may not represent an exhaustive list of research needs. Some species have several identified research needs, others have only one. This is not necessarily a reflection of current levels of knowledge or some inferred relative importance. In many cases, more knowledge begets more questions. Alternatively, species with few threats or management conflicts require less concern and therefore received less attention during the panel process. It should also be pointed out that panelists were drawn from a variety of backgrounds and some emphasized the need to acquire new knowledge more than did others. Finally, the "Research Needs" column does not represent the only areas of information lacking about the species in question. The column "Potential Applications" identifies one or two of the benefits of pursuing each area of research. It is important to keep in mind that the benefits of research derived information compounds and unexpected insight is commonly gained through scientific inquiry.

The RDA table is a resource that can be used by many groups in many ways. Most obviously, researchers, graduate students, and organization applying to Federal land management agencies for research funds can use the table to help justify their requests. Federal research organizations (e.g., National Biological Survey and Forest Service Research Stations) can use the RDA table to pursue areas of emphases (e.g., reproductive biology or responses to management activities) identified as important to land managers. Land managers can use the RDA table to become aware of rare plant issues within their jurisdiction. Consumptive industries will be able to use the RDA table to assess where their activities maybe in conflict with plant conservation goals. They may then choose to support research activities that will resolve the issues and clear lingering uncertainties that often constrain management options. Environmental groups and native plant organizations can use the RDA table to focus their conservation concerns, educational activities and advocacy actions. Educators may use the RDA table to help students understand the process of information gathering and to demonstrate the link between research and the application of knowledge. There are certainly other ways that the RDA table can be used. It is hoped that by identifying areas of need, information and understanding that will benefit everyone will be gained.

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Species name	Research Need	Potential Application
Abronia ammophila	Are inventory efforts to document population sizes and geographic amplitude adequate for this rare species?	Inventory for this rare species could provide valuable information on population sizes and geographic distribution. This information could be incorporated into monitoring protocol and management direction.
Abronia ammophila	Are the Sublette County and Yellowstone Park populations representative of the same taxon?	Resolution of the taxonomic relationships of the two geographically-separate "populations" could provide valuable information about the geographic amplitude of the species. This information should preclude the development of management.
Abronia ammophila	What are the environmental requirements of this rare species?	Trend, demographic, and ecophysiological monitoring could provide valuable information about the environmental requirements and limiting factors of this rare species. This information could be incorporated into management direction.
Agrostis rossiae	To what extent is this rare species threatened by changes in the geohydrothermal regime that supports its habitat?	Trend and demographic monitoring of populations historically, presently, and or potentially impacted by changes in the geohydrothermal regime supporting its habitat could provide valuable information which could be incorporated into management direction.
Agrostis rossiae	What are the environmental requirements of this rare grass?	Trend, demographic, and ecophysiological monitoring could provide valuable information about the environmental requirements and limiting factors of this rare species. This information could be incorporated into management direction.
Allium aaseae	To what extent is this rare species threatened by mining activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for incorporation into management direction.
Allium aaseae	To what extent is this rare species threatened by recreational activities, particularly traffic from off-road vehicles?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities including off-road vehicle traffic could provide valuable information which could be incorporated into management direction.
Allium aaseae	To what extent is this rare species threatened by the invasion of its habitat by exotic species, including those introduced in seeding prescriptions?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide valuable information which could be incorporated into management guidelines.
Allium aaseae	What are the environmental requirements of this species? What are its limiting factors?	Demographic and ecophysiological monitoring could provide valuable baseline information on the environmental requirements and limiting factors of the species. This information could be used in the development of monitoring protocol and management.
Allium dictuon	What are population sizes and geographic amplitude of this narrow endemic species?	Inventory of this rare species could provide valuable information on its population sizes, amplitude, and vulnerability to management activities. This information could be incorporated into monitoring designs and management direction.
Allium dictuon	What are the effects of fire suppression activities on the habitat that supports this narrow endemic species?	Trend, demographic, and ecophysiological monitoring of populations impacted by fire suppression activities (the construction of fire lines, in particular) could provide valuable information for incorporation into management guidelines.
Allium dictuon	What are environmental requirements for this species and why is its geographic amplitude apparently so limited?	Trend, demographic, and ecophysiological monitoring could provide valuable information on the basic biology of this narrow endemic species. This information could be incorporated into management direction.

Species name	Research Need	Potential Application
<i>Amsinckia carinata</i>	Is this a valid taxon? Why was the species merged with <i>A. tessellata</i> in Jepson's treatment?	Resolution of the taxonomic status of this "species" precludes the development of monitoring and management plans.
<i>Amsinckia carinata</i>	To what extent is the genetic integrity of this species threatened by hybridization with sympatric <i>A. tessellata</i> ?	Ecophysiological monitoring could provide information on the extent of hybridization and resultant effects on the gene pool. This information could be incorporated into management guidelines.
<i>Amsinckia carinata</i>	To what extent is this species threatened by the invasion of exotic species, particularly cheatgrass and Russian thistle?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by exotic species could provide valuable information for incorporation into management direction.
<i>Amsinckia carinata</i>	What are the environmental requirements of this species?	Ecophysiological monitoring of this species could provide valuable information on its environmental requirements. This information could be incorporated into management guidelines.
<i>Antennaria arcuata</i>	Is this species threatened by agricultural practices including the application of chemicals (herbicides and fertilizers) and tillage?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by these agricultural practices could provide valuable information for incorporation into management direction.
<i>Antennaria arcuata</i>	Is this species threatened by exotic species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information for incorporation into management direction.
<i>Antennaria aromatica</i>	To what extent is this rare species threatened by development?	Trend and demographic monitoring in the portion of this species' range (Anaeroid lake) where potential for housing development exists could provide valuable information for incorporation into management guidelines.
<i>Antennaria aromatica</i>	To what extent is this rare species threatened by introduced mountain goats and bighorn sheep?	Trend and demographic monitoring of populations of this rare species historically, presently, and/or potentially impacted by introduced mountain goats and/or big horn sheep could provide valuable information which could be incorporated into management.
<i>Arabis fecunda</i>	Is this species threatened by the encroachment of its habitat by exotic species (spotted knapweed)? Would the use of herbicides for controlling exotics adversely affect the species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotics or the herbicides used in controlling them could be useful to management.
<i>Arabis fecunda</i>	What are the effects of grazing and mining on this species?	Assessment of effects on known populations of grazing, trampling associated with grazing, and mining could provide guidelines consistent with the conservation of the species for management.
<i>Arabis fecunda</i>	What is the population trend for this species of concern?	Assessment of the population dynamics and trend of this species could enable management direction consistent with the conservation and viability of the species to be formulated.
<i>Arabis suffrutescens</i> var. <i>horizontalis</i>	Is this rare species adversely impacted by or threatened by recreational activities, particularly trampling by hikers?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by recreational activities could provide valuable information for incorporation into management guidelines.
<i>Arabis suffrutescens</i> var. <i>horizontalis</i>	Is this taxon valid? Does this variety which is supposedly limited to the Crater Lake area also occur in California?	Resolution of the taxonomic status of this rare variety and determination of its population sizes and geographic amplitude precludes the development of monitoring and management guidelines.
<i>Arabis suffrutescens</i> var. <i>horizontalis</i>	What are the environmental requirements of this rare species?	Trend, demographic, and ecophysiological monitoring of this species could provide valuable information on its environmental requirements and limiting factors.

Species name	Research Need	Potential Application
<i>Artemisia campestris</i> var. <i>wormskioldii</i>	How does this variety of concern respond to grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
<i>Artemisia campestris</i> var. <i>wormskioldii</i>	To what extent is this variety of concern threatened by the conversion of habitat to agricultural production, particularly conversion to orchards?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by agricultural conversion could provide valuable information for incorporation into management direction.
<i>Artemisia campestris</i> var. <i>wormskioldii</i>	What are the impacts of recreational activities on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide valuable information for incorporation into management direction.
<i>Artemisia campestris</i> var. <i>wormskioldii</i>	What is the reproductive biology of this rare variety? What is its viability threshold, what are its diseases, seed predators, germination requirements?	Laboratory and demographic and ecophysiological monitoring could provide valuable basic biological information about this variety of concern. The limiting factors identified in the studies mentioned above could be used to formulate management guidelines
<i>Artemisia campestris</i> var. <i>wormskioldii</i>	Will elevation of pool levels behind hydroelectric dams adversely affect this species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by changes in hydrology could provide valuable information for incorporation into management direction.
<i>Artemisia ludoviciana</i> ssp. "estesii"	To what extent is this unpublished taxon impacted by alterations in the hydrologic regime supporting its habitat?	Trend and demographic monitoring of populations impacted by changes in hydrology could provide valuable information which could be incorporated into management direction.
<i>Artemisia ludoviciana</i> ssp. "estesii"	To what extent is this unpublished taxon impacted by grazing?	Trend and demographic monitoring in populations affected by grazing could provide valuable information for incorporation into management direction.
<i>Artemisia ludoviciana</i> ssp. "estesii"	To what extent is this unpublished taxon impacted by recreational activities?	Trend and demographic monitoring in populations affected by recreational activities could provide valuable information for incorporation into management direction.
<i>Artemisia ludoviciana</i> ssp. "estesii"	What are the sizes of the populations and geographic amplitude of this unpublished species, specifically in the Deschutes River basin?	Inventory efforts for this species could determine population sizes and geographic amplitude. This baseline information could be used in formulating monitoring and management strategy.
<i>Artemisia ludoviciana</i> ssp. "estesii"	What is the taxonomic status of this unpublished subspecies?	Resolution of the taxonomic status of this unpublished subspecies precludes the development of monitoring and management guidelines.
<i>Aster jessicae</i>	Do exotic species threaten the known populations of this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information for incorporation into management direction.
<i>Aster jessicae</i>	Is the remaining habitat of this species threatened by housing development on "choice view" sites?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by housing developments could provide valuable information for incorporation into management direction.
<i>Aster jessicae</i>	To what extent has the habitat of this species been diminished because of the agricultural conversion of its habitat?	Trend and demographic of populations historically, presently, and/or potentially impacted by the conversion of habitat to agricultural production could provide valuable information for incorporation into management direction.
<i>Aster jessicae</i>	To what extent has this species been adversely impacted by fire suppression?	Trend and demographic of populations historically, presently, and/or potentially impacted by fire and/or fire suppression could provide valuable information which could be incorporated into management guidelines.

Species name	Research Need	Potential Application
<i>Aster jessicae</i>	To what extent has this species been adversely impacted by grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing could provide valuable information for incorporation into management direction.
<i>Aster jessicae</i>	To what extent has this species been adversely impacted by the application, direct and indirect, of herbicides?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by herbicide application could provide valuable information for incorporation into management direction.
<i>Aster jessicae</i>	What impacts have changes in the fire regime had on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire, fire suppression, and/or changes in the fire regime could provide valuable information for incorporation into management direction.
<i>Aster jessicae</i>	What is the reproductive biology of this species? Are there opportunities for seed banking?	Laboratory studies and demographic/ecophysiological monitoring could provide valuable information on the reproductive biology of this rare species. Seed banking and opportunities to incorporate this species into restoration projects could be identified.
<i>Aster jessicae</i>	Will proposed agricultural conversion further diminish the habitat and range of this rare species?	Trend and demographic monitoring of populations historically, presently, and or potentially impacted by agricultural conversion could provide valuable information for incorporation into management direction.
<i>Aster mollis</i>	Are inventory efforts for this rare species adequate in Wyoming?	Inventory for this rare species could provide valuable information on the population sizes and geographic distribution. This baseline information could be useful in the development of monitoring and management strategies.
<i>Astragalus anserinus</i>	To what extent is this rare species threatened by recreational activities, particularly the use of off-road vehicles?	Trend and demographic monitoring of populations impacted by exotics and/or by recreational activities (especially off-road vehicles) could provide valuable information that could be incorporated into management guidelines.
<i>Astragalus anserinus</i>	To what extent is this rare species threatened by the invasion of exotic species including crested wheatgrass?	Trend and demographic monitoring of populations impacted by exotics and/or by crested wheatgrass seedings could provide valuable information which could be incorporated into management guidelines.
<i>Astragalus anserinus</i>	What are the environmental requirements of the species? Its limiting factors?	Demographic and ecophysiological monitoring of this species could provide valuable information on its environmental requirements and limiting factors. This could be incorporated into management direction.
<i>Astragalus applegatei</i>	To what extent is this rare species impacted by fire and/or fire suppression?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural or prescribed burns could provide valuable information for incorporation into management guidelines. Indications are for beneficial effects.
<i>Astragalus applegatei</i>	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management guidelines.
<i>Astragalus applegatei</i>	To what extent is this rare species threatened by rodents and lagomorphs?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by rodents and/or lagomorphs could provide valuable information for incorporation into management guidelines.
<i>Astragalus applegatei</i>	What are the environmental requirements for this rare species? What are the characteristics of its breeding system, germination requirements, seed bank, etc.?	Ecophysiological monitoring could provide valuable information on the basic environmental requirements of this rare species including its pollinators, seed production and viability rates, ability to withstand transplanting, etc.

Species name	Research Need	Potential Application
<i>Astragalus atratus</i> var. <i>inseptus</i>	To what extent is this rare variety impacted by development, particularly range improvement projects?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by range improvement projects including crested wheat grass seeding could provide valuable information for incorporation into management direction.
<i>Astragalus atratus</i> var. <i>inseptus</i>	To what extent is this rare variety impacted by exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species including crested wheat grass seeding could provide valuable information for incorporation into management direction.
<i>Astragalus atratus</i> var. <i>inseptus</i>	To what extent is this rare variety impacted by fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire, fire suppression, and/or changes in the fire regime could provide valuable information for incorporation into management direction.
<i>Astragalus atratus</i> var. <i>inseptus</i>	What are the environmental requirements and limiting factors of this rare variety?	Demographic and ecophysiological monitoring could provide valuable information on the environmental requirements of this species and its limiting factors. This information could be incorporated into management direction.
<i>Astragalus collinus</i> var. <i>laurentii</i>	Does housing development threaten this variety of concern?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by housing development could provide valuable information that could be incorporated into management direction.
<i>Astragalus collinus</i> var. <i>laurentii</i>	How is this variety of concern affected by herbicidal application both direct and indirect?	Trend monitoring in known roadside populations that are periodically boom sprayed by the county road department should provide valuable information that can be incorporated into the formulation of management guidelines.
<i>Astragalus collinus</i> var. <i>laurentii</i>	How is this variety of concern being impacted by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Astragalus collinus</i> var. <i>laurentii</i>	How is this variety of concern impacted or potentially impacted by road construction and/or maintenance?	Trend monitoring in known roadside populations that might be impacted by road construction/maintenance activities could provide valuable information which could be incorporated into management direction.
<i>Astragalus collinus</i> var. <i>laurentii</i>	Is seed banking a viable alternative for increasing this variety of concern and incorporating it into restoration opportunities?	Exploring the possibilities of seed banking may enable a seed increasing program to be developed. This variety of concern could then be used in restoration prescriptions for appropriate habitats.
<i>Astragalus collinus</i> var. <i>laurentii</i>	What is the genetic and taxonomic "status" of this variety of concern? How does it differ from its sympatric progenitor, <i>A. collinus</i> var. <i>collinus</i> ?	Genetic studies could resolve the taxonomic status of this species and also determine its genetic uniformity and vulnerability. This information could be useful to management.
<i>Astragalus columbianus</i>	Are exotic species a threat to this rare plant?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management direction.
<i>Astragalus columbianus</i>	How does this rare species respond to mining activities, particularly those associated with the extraction of diatomaceous earth?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide valuable information which could be incorporated into management guidelines.

Species name	Research Need	Potential Application
<i>Astragalus columbianus</i>	Is this rare species adversely affected by grazing, particularly sheep grazing?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
<i>Astragalus columbianus</i>	Is this species threatened by agricultural conversion of habitat, particularly conversion associated with orchard expansion?	Trend monitoring of populations proximal to orchard operations should provide valuable information which could be used in the formulation of management direction.
<i>Astragalus columbianus</i>	What are the effects of fire and/or fire suppression on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire, fire suppression, and/or changes in the fire regime could provide valuable information for incorporation into management direction.
<i>Astragalus columbianus</i>	What are the effects of military maneuvers (training) on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by military maneuvers could provide valuable information for incorporation into management direction.
<i>Astragalus columbianus</i>	What are the effects of recreational activities on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide valuable information for incorporation into management direction.
<i>Astragalus diaphanus</i> var. <i>diaphanus</i>	Is scarification of seed essential for the germination of this species?	Ecophysiological monitoring supported by laboratory work could provide valuable information on the seed physiology of this rare species. This information could be incorporated into management direction.
<i>Astragalus diaphanus</i> var. <i>diumus</i>	How can this diminutive annual species be monitored?	Development of an appropriate demographic monitoring protocol could provide a monitoring strategy for evaluating impacts of management activities to this species.
<i>Astragalus diaphanus</i> var. <i>diumus</i>	To what extent is this rare species adversely impacted by predation by insects?	Ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements including seed bank, pollinators, predation of seed by insects, etc. Information could be incorporated into management direction.
<i>Astragalus diaphanus</i> var. <i>diumus</i>	What are the environmental requirements for this narrow endemic species?	Ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements including seed bank, pollinators, role in nitrogen fixation, etc. This information could be incorporated into management direction.
<i>Astragalus diaphanus</i> var. <i>diumus</i>	What is the extent of the natural seed bank of this species? What fluctuations in population dynamics are attributable to naturally-induced verses management-induced causes?	Demographic and ecophysiological monitoring could provide valuable information about the basic environmental requirements of this species including its seed bank, germination requirements, dependency upon soil bacteria, etc.
<i>Astragalus diaphanus</i> var. <i>diumus</i>	What is the genetic variability of this species across its narrow geographic range?	Determination of the genetic variability of the species could provide valuable information for predicting the vulnerability of the species to changing environmental factors.
<i>Astragalus diaphanus</i> var. <i>diumus</i>	What is the taxonomic relationship between this variety and <i>Astragalus diaphanus</i> var. <i>diaphanus</i> ?	Resolution of the taxonomic relationship with progenitors or sympatric species precludes the development of monitoring strategies and/or management direction.
<i>Astragalus howellii</i>	How does this rare species respond to fire?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural or prescribed fire could provide valuable information for incorporation into management direction.
<i>Astragalus howellii</i>	How does this rare species respond to grazing?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Astragalus howellii</i>	What is the ecological niche of this species in succession?	Trend, demographic, and ecophysiological monitoring could provide valuable information on the successional dynamics of this species.
<i>Astragalus mulfordiae</i>	To what extent is this rare species threatened by a combination of increased fuel load caused by exotic species and fire?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by high intensity fires attributable to accumulated fuels could provide information on fire effects, exotics, etc.
<i>Astragalus mulfordiae</i>	To what extent is this rare species threatened by fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by natural and/or prescribed fire could provide valuable information on fire effects for incorporation into management direction.
<i>Astragalus mulfordiae</i>	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by grazing could provide valuable information for incorporation into management direction.
<i>Astragalus mulfordiae</i>	To what extent is this rare species threatened by grazing of cattle, sheep, and lagomorphs?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by domestic livestock and lagomorph grazing could provide valuable information for incorporation into management guidelines.
<i>Astragalus mulfordiae</i>	To what extent is this rare species threatened by herbicidal applications used in conjunction with sagebrush eradication?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by aerial herbicidal application associated with sagebrush eradication could provide valuable information for incorporation into management guidelines.
<i>Astragalus mulfordiae</i>	To what extent is this rare species threatened by recreational activities, particularly the use of off-road vehicles?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by recreational activities could provide valuable information for incorporation into management direction.
<i>Astragalus mulfordiae</i>	To what extent is this rare species threatened by road construction and/or road maintenance projects?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by road construction/maintenance could provide valuable information for incorporation into management direction.
<i>Astragalus mulfordiae</i>	To what extent is this species threatened by agricultural conversion and/or housing development?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by agricultural conversion or housing development could provide valuable information for incorporation into management guidelines.
<i>Astragalus mulfordiae</i>	To what extent is this species threatened by fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, or potentially impacted by natural and/or prescribed fire could provide information for incorporation into management direction.
<i>Astragalus mulfordiae</i>	To what extent is this species threatened by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
<i>Astragalus mulfordiae</i>	To what extent is this species threatened by the invasion of exotic species, including those in seeding prescriptions?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotics (or seeding of them) could provide valuable information for incorporation into management direction.
<i>Astragalus mulfordiae</i>	What are the environmental requirements and limiting factors of this species?	Demographic and ecophysiological monitoring would provide information on the ecological requirements and limiting factors of this species. This information could be incorporated into management direction.

Species name	Research Need	Potential Application
<i>Astragalus onieiformis</i>	What are the impacts of exotic species on this rare species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information for incorporation into management guidelines.
<i>Astragalus oniciformis</i>	What are the impacts of fire and/or fire suppression on this species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide valuable information for incorporation into management guidelines.
<i>Astragalus oniciformis</i>	What are the impacts of seeding prescriptions, particularly of <i>Agropyron cristatum</i> , on this species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by crested wheatgrass seedings could provide information for incorporation into management guidelines.
<i>Astragalus onieiformis</i>	What is the taxonomic "status" of this species and its genetic relationship to other <i>Astragalus</i> species?	Determination of taxonomic status and relationship should preclude the development of monitoring protocol and management direction.
<i>Astragalus paysonii</i>	Has this species received adequate inventory effort in Wyoming?	Inventory conducted for this species could provide valuable information on its population sizes and geographic amplitude. This valuable information could be incorporated into monitoring protocol and management direction.
<i>Astragalus paysonii</i>	To what extent is this species benefited by periodic fire and its attendant opening of the forest canopy?	Trend and demographic monitoring of populations historically, presently, and potentially impacted by fire or alterations in the fire regime could provide information for incorporation into management direction.
<i>Astragalus paysonii</i>	To what extent is this species impacted by fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide valuable information which could be incorporated into management guidelines.
<i>Astragalus paysonii</i>	To what extent is this species impacted by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management guidelines.
<i>Astragalus paysonii</i>	To what extent is this species limited to early seral successional communities/associations?	Determination of the successional status and requirements of this species of concern could provide valuable information for incorporation into management direction.
<i>Astragalus paysonii</i>	What are the environmental requirements of this species?	Trend, demographic, and ecophysiological monitoring could provide information on the environmental requirements of this species. This information could be incorporated into management direction.
<i>Astragalus paysonii</i>	What is the seral status of this species in natural succession?	Ecological plot analysis combined with trend and demographic monitoring could provide information relative to the species' requirement for seral conditions.
<i>Astragalus peckii</i>	How does this rare species respond to fire?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural or prescribed fire could provide valuable information for incorporation into management direction.
<i>Astragalus peckii</i>	To what extent is this species threatened by housing developments?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by housing development could provide valuable information for incorporation into management direction.
<i>Astragalus peckii</i>	To what extent is this species threatened by recreational activities, particularly off road vehicles?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by recreational activities could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Astragalus peckii</i>	To what extent is this species threatened by timber harvest?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by timber harvest could provide valuable information for incorporation into management direction.
<i>Astragalus peckii</i>	What are the environmental requirements for this narrow endemic species?	Ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements including seed bank, pollinators, role in nitrogen fixation, etc. This information could be incorporated into management direction.
<i>Astragalus pulsiferæ</i> var. <i>suksdorfii</i>	To what extent is this rare variety threatened by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by natural and/or prescribed fire could provide information for incorporation into management direction.
<i>Astragalus pulsiferæ</i> var. <i>suksdorfii</i>	To what extent is this rare variety threatened by recreational activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened recreational activities could provide valuable information for incorporation into management direction.
<i>Astragalus pulsiferæ</i> var. <i>suksdorfii</i>	To what extent is this rare variety threatened by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by the invasion of exotic species could provide information for incorporation into management direction.
<i>Astragalus pulsiferæ</i> var. <i>suksdorfii</i>	To what extent is this rare variety threatened by timber harvest activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened timber harvest activities could provide valuable information for incorporation into management direction.
<i>Astragalus pulsiferæ</i> var. <i>suksdorfii</i>	What are the environmental requirements of this rare species? Do these requirements cause its bicentric distribution (Washington and California)?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements and limiting factors. This information could be incorporated into management guidelines.
<i>Astragalus scaphoides</i>	To what extent is this rare species impacted by fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire and/or fire suppression could provide valuable information which could be incorporated into management guidelines.
<i>Astragalus scaphoides</i>	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management guidelines.
<i>Astragalus scaphoides</i>	To what extent is this rare species impacted by hydrologic developments?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by projects which alter hydrologic regime could provide information which could be incorporated into management guidelines.
<i>Astragalus sinuatus</i>	Is this rare species threatened by the encroachment of exotic plant species into its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide information for incorporation into management direction.
<i>Astragalus sinuatus</i>	To what extent is this rare species affected by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide valuable information which could be incorporated into management guidelines.
<i>Astragalus sinuatus</i>	To what extent is this rare species affected by grazing activities?	Trend and demographic monitoring populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management guidelines.
<i>Astragalus sinuatus</i>	To what extent is this rare species affected by mining activities?	Trend and demographic monitoring populations historically, presently, and/or potentially impacted by mining activities could provide valuable information which could be incorporated into management guidelines.

Species name	Research Need	Potential Application
<i>Astragalus sinuatus</i>	To what extent is this rare species affected by road construction and/or maintenance?	Trend and demographic monitoring populations historically, presently, and/or potentially impacted by road construction/maintenance could provide valuable information which could be incorporated into management guidelines.
<i>Astragalus sinuatus</i>	To what extent is this rare species affected by the invasion or seeding of exotic species?	Trend and demographic monitoring populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management guidelines.
<i>Astragalus sinuatus</i>	What are the effects of grazing on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
<i>Astragalus sinuatus</i>	What are the environmental requirements of this rare species?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable baseline information on its environmental requirements and limiting factors. This information could be incorporated into management direction.
<i>Astragalus sinuatus</i>	What is its reproductive biology? Do fungi diminish seed set and viability?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the seed fungus could provide valuable information for incorporation into management direction.
<i>Astragalus sinuatus</i>	Would seed banking work for this species and perhaps enable it to be used for restoration?	Seed banking success could result in an increase in seed available for use in restoration activities. This information could be incorporated into management direction.
<i>Astragalus solitarius</i>	Does Wyoming big sagebrush prevent this rare species from being impacted by grazing?	Ecophysiological monitoring could document the dependence of the rare species on the dominant shrub. This information could be incorporated into management guidelines.
<i>Astragalus solitarius</i>	How have the population sizes and geographic amplitude of this rare species been diminished by crested wheat grass seedings?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by displacement with crested wheat grass could provide valuable information for incorporation into management direction.
<i>Astragalus solitarius</i>	Is this rare species threatened by mining activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for incorporation into management guidelines.
<i>Astragalus solitarius</i>	To what extent is this species affected by impacts to its supporting species, <i>Artemisia tridentata wyomingensis</i> ? What are the effects of fire on this relationship and/or dependency?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by fire and/or fire suppression could provide information for incorporation into management direction.
<i>Astragalus sterilis</i>	What are the impacts mining activities on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the mining activities. Could provide valuable information for the formulation of management direction.
<i>Astragalus sterilis</i>	What are the impacts of wildlife grazing on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the grazing activities of wild animals could provide valuable information for the formulation of management direction.
<i>Astragalus sterilis</i>	To what extent is this rare species adversely affected by the invasion of exotic species, particularly cheatgrass?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species, particularly cheatgrass. Could provide valuable information for the formulation of management direction.

Species name	Research Need	Potential Application
<i>Astragalus sterilis</i>	What are the environmental requirements of this rare species?	Ecophysiological monitoring of this species could provide valuable information on its environmental requirements including pollination mechanisms, seed viability, extent of seed banking, etc. This information could be incorporated into management.
<i>Astragalus sterilis</i>	What is the taxonomic status of this rare species? Is it a variety of <i>Astragalus cusickii</i> ? What is its genetic relationship with <i>A. cusickii</i> ?	Resolution of the taxonomic status of this species precludes the formulation of monitoring and/or management strategy.
<i>Astragalus sterilis</i>	Is this a valid taxon? What is its relationship with <i>A. cusickii</i> ?	Resolution of the taxonomic status and systematic relationship should preclude the development of monitoring protocol and management direction.
<i>Astragalus sterilis</i>	What are the environmental requirements for this species? What are its limiting factors?	Demographic and ecophysiological monitoring could provide valuable information on the environmental requirements of this species and its limiting factors. This information could be incorporated into management direction.
<i>Astragalus sterilis</i>	How does this species respond to fire and/or fire suppression?	Trend and demographic monitoring of population historically, presently, and/or potentially impacted by natural and/or prescribed burning could provide information for incorporation into management direction.
<i>Astragalus sterilis</i>	How does this species respond to grazing?	Trend and demographic monitoring of population historically, presently, and/or potentially impacted by grazing could provide valuable information for incorporation into management direction.
<i>Astragalus sterilis</i>	How does this species respond to invasive exotics including those introduced in seeding prescriptions?	Trend and demographic monitoring of population historically, presently, and/or potentially impacted by the invasion of exotics could provide valuable information for incorporation into management direction.
<i>Astragalus sterilis</i>	How does this species respond to mining activities?	Trend and demographic monitoring of population historically, presently, and/or potentially impacted by mining could provide valuable information for incorporation into management direction.
<i>Astragalus tegetarioides</i>	How does this rare species respond to fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, or potentially impacted by natural and/or prescribed fire could provide information for incorporation into management guidelines.
<i>Astragalus tegetarioides</i>	How does this rare species respond to grazing activities?	Trend and demographic monitoring of populations historically, presently, or potentially impacted by grazing activities could provide valuable information for incorporation into management guidelines.
<i>Astragalus tegetarioides</i>	What are the environmental requirements for this rare species?	Ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements including reproductive success, seed bank, etc.
<i>Astragalus tyghensis</i>	To what extent is this species threatened by excavation (gravel pit) activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by gravel pit excavation could provide valuable information for incorporation into management direction.
<i>Astragalus tyghensis</i>	To what extent is this species threatened by habitat fragmentation caused by agricultural conversion?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by agricultural conversion could provide valuable information for incorporation into management direction.
<i>Astragalus tyghensis</i>	To what extent is this species threatened by indirect and direct application of herbicides?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by herbicidal application could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Astragalus tyghensis</i>	To what extent is this species threatened by the invasion of its habitat by exotic species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management direction.
<i>Astragalus tyghensis</i>	To what extent is this species threatened fire and/or fire suppression?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide valuable information for incorporation into management direction.
<i>Astragalus tyghensis</i>	To what extent is this species threatened grazing by domestic animals and wildlife?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing of domestic and wild species could provide valuable information for incorporation into management direction.
<i>Astragalus vexilliflexus</i> var. <i>nubilus</i>	Are inventory efforts for this rare species adequate, particularly on the west side of the white cloud crest?	Inventory for this rare species could provide valuable information on population sizes and geographic amplitude of this rare species. This information could be useful in the development of monitoring protocol and management guidelines.
<i>Astragalus vexilliflexus</i> var. <i>nubilus</i>	To what extent is this species threatened by grazing activities?	Trend and demographic monitoring of populations historically, presently, and potentially impacted by grazing could provide valuable information which could be incorporated into management direction.
<i>Astragalus yoder-williamsii</i>	What is the genetic relationship of this species with other sympatric species such as <i>A. mulfordiae</i> and <i>A. oniciformis</i> ?	Taxonomic status and relationships of this species should preclude the development of monitoring protocol and management direction.
<i>Astragalus yoder-williamsii</i>	How does this rare species respond to fire and/or fire suppression? Does it need periodic fire?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by natural and/or prescribed fires could provide valuable information which could be incorporated into management direction.
<i>Astragalus yoder-williamsii</i>	How does this rare species respond to grazing?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing could provide valuable information for incorporation into management direction.
<i>Astragalus yoder-williamsii</i>	How does this rare species respond to juniper encroachment and the resultant alteration of habitat?	Trend and demographic monitoring of the species in areas where juniper encroachment is occurring could provide valuable information which could be incorporated into management direction.
<i>Balsamorhiza rosea</i>	Does hybridization threaten the genetic integrity of this rare species?	Genetic studies in sympatric populations could provide valuable information about the genetic integrity and vulnerability of this species. This information could be incorporated into management direction.
<i>Balsamorhiza rosea</i>	Have seed banking efforts been conducted in an effort to utilize this rare species in restoration prescriptions in sites having suitable habitat?	Seed banking success could result in an increase in available seed stock which could be used in restoration activities.
<i>Balsamorhiza rosea</i>	To what extent are populations of this rare species threatened by herbicidal drift from agricultural applications occurring on adjacent lands?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by agricultural herbicides could provide valuable information for incorporation into management guidelines.
<i>Balsamorhiza rosea</i>	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by grazing activities could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
Balsamorhiza rosea	To what extent is this species threatened by development, particularly the construction of wind-energy towers, microwave towers, and television towers?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by commercial (tower) development could provide information for incorporation into management guidelines.
Balsamorhiza rosea	To what extent is this species threatened by recreational activities, particularly off road vehicular traffic?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide valuable information for incorporation into management guidelines.
Botrychium ascendens	Are mycorrhizae essential for the reproduction of this species? If so, which mycorrhizae?	Ecophysiological monitoring could provide information on the specific mycorrhizal requirements of this species. This information could be incorporated into management guidelines.
Botrychium ascendens	How does this rare species respond to fire and/or fire suppression?	Trend monitoring in populations impacted by or potentially impacted by natural or prescribed burning could provide valuable information for incorporation into management direction.
Botrychium ascendens	How does this rare species respond to severe changes in the light and moisture regime caused by clear cutting?	Trend monitoring in populations impacted by or potentially impacted by opening of the canopy by timber harvest could provide valuable information on the species' response to such activities. This information could be incorporated into guidelines.
Botrychium ascendens	How is this species affected by timber harvest activities? By alterations in the light regime?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by logging could provide valuable information which could be incorporated into management direction.
Botrychium ascendens	To what extent does this rare species need site disturbance to survive?	Trend monitoring in various sites in which different types of disturbance have occurred or are scheduled to occur could provide valuable information for the development of management direction.
Botrychium ascendens	To what extent is this rare species impacted by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by fire could provide valuable information which could be incorporated into management direction.
Botrychium ascendens	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
Botrychium ascendens	To what extent is this rare species impacted by recreational activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by recreational Activities (hiking) could provide valuable information which could be incorporated into management direction.
Botrychium ascendens	What are the environmental requirements of this rare species?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable information about its environmental requirements and limiting factors. This information could be incorporated into management direction.
Botrychium ascendens	What are the mycorrhizal requirements for this rare species?	Demographic and ecophysiological monitoring of this species could provide valuable information on its environmental requirements and limiting factors. This information could be incorporated into management direction.
Botrychium ascendens	What is the genetic relationship of this species to other Botrychiums that are usually found in association with it?	Determination of the genetic integrity of the species and its relationship with sympatric species is essential in confirming its "rare" status. From this information, management direction could be developed.

Species name	Research Need	Potential Application
<i>Botrychium ascendens</i>	What is the taxonomic status of this species? What are its genetic relationships with the other <i>Botrychium</i> species with which it frequently grows?	Resolution of the taxonomic status of this rare species through cytogenetic and electrophoretic genetic investigations should preclude the development of monitoring protocol and management direction?
<i>Botrychium crenulatum</i>	Have inventory efforts for this rare species been adequate?	Inventory for this rare species could provide valuable information on its population sizes and geographic amplitude. This information could be incorporated into management direction.
<i>Botrychium crenulatum</i>	How does this rare species respond to fire and/or fire suppression? How does it respond to variation in the seasonality of burning?	Trend and demographic monitoring of this species in conjunction with burn history and/or prescribed fires could provide valuable information for incorporation into management direction.
<i>Botrychium crenulatum</i>	Is this rare species adversely affected by seeding projects which include non-native grass species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by seeding prescriptions could provide valuable information for incorporation into management guidelines.
<i>Botrychium crenulatum</i>	Is this rare species adversely affected by trampling by grazing animals?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management guidelines.
<i>Botrychium crenulatum</i>	To what extent is this rare species impacted by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by fire could provide valuable information which could be incorporated into management direction.
<i>Botrychium crenulatum</i>	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information which could be incorporated into management direction.
<i>Botrychium crenulatum</i>	What are the environmental requirements for this rare species? What mycorrhizae are essential for its survival?	Ecophysiological monitoring could provide valuable information about the basic environmental requirements of the species including dependency upon specific mycorrhizae. This information could be incorporated into management direction.
<i>Botrychium crenulatum</i>	What are the environmental requirements of this rare species?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable information about its environmental requirements and limiting factors. This information could be incorporated into management direction.
<i>Botrychium crenulatum</i>	What is the genetic relationship of this species to other botrychiums that are usually found in association with it?	Determination of the genetic integrity of the species and its relationship with sympatric species is essential in confirm its "rare" status. From this information management direction could be developed.
<i>Botrychium crenulatum</i>	What is the taxonomic status of this species? What are its genetic relationships with the other <i>Botrychium</i> species with which it frequently grows?	Resolution of the taxonomic status of this rare species through cytogenetic and electrophoretic genetic investigations should preclude the development of monitoring protocol and management direction?
<i>Botrychium crenulatum</i>	Does this species depend upon specific soil mycorrhizae? What are these mycorrhizae?	Ecophysiological monitoring could provide valuable information on the interrelationship of this rare species and soil mycorrhizae. Management direction could be formulated accordingly.
<i>Botrychium crenulatum</i>	How does this species respond to fire and/or fire suppression?	Trend monitoring in populations impacted by or potentially impacted by natural or prescribed burning could provide valuable information from which management direction could be formulated

Species name	Research Need	Potential Application
<i>Botrychium crenulatum</i>	How does this species respond to the opening of the canopy that is associated with timber harvest activity?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by timber harvest activities could provide useful information which could be incorporated into management direction.
<i>Botrychium lunaria</i>	How does this species respond to fire and/or fire suppression?	Trend monitoring in populations impacted by or potentially impacted by natural or prescribed burning could provide valuable information from which management direction could be formulated.
<i>Botrychium lunaria</i>	How does this species respond to harvest activities that result in an opening of the canopy?	Trend monitoring in populations impacted by or potentially impacted by harvest activities could provide valuable information. These findings could be used in the development of management guidelines.
<i>Botrychium lunaria</i>	How genetically different is this species from the other botrychiums that have been split from it taxonomically?	Laboratory research including cytological and electrophoretic work could provide information on the taxonomic status of this rare species. This information could be incorporated into management guidelines.
<i>Botrychium lunaria</i>	What are the mycorrhizal requirements for this species?	Ecophysiological monitoring could provide valuable information regarding the interrelationships of this species and specific mycorrhizae. This information could be incorporated into management direction.
<i>Botrychium paradoxum</i>	How does this species respond to fire and/or fire suppression?	Trend and demographic monitoring conducted in conjunction with historic, present, and potential natural or prescribed burns could provide information which could be used in formulating management direction.
<i>Botrychium paradoxum</i>	How does this species respond to grazing?	Trend and demographic monitoring of this species in areas impacted by grazing could provide useful information which could be incorporated into management direction.
<i>Botrychium paradoxum</i>	How is this species dependent upon mycorrhizae? Which specific mycorrhizae?	Ecophysiological monitoring should determine any type of symbiotic relationship between this rare species and soil mycorrhizae. This information could be incorporated into management guidelines.
<i>Botrychium paradoxum</i>	To what extent does this rare species need site disturbance to survive?	Trend monitoring in various sites in which different types of disturbance have occurred or are scheduled to occur could provide valuable information for the development of management direction.
<i>Botrychium paradoxum</i>	To what extent is this rare species impacted by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by fire could provide valuable information which could be incorporated into management direction.
<i>Botrychium paradoxum</i>	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Botrychium paradoxum</i>	What are the environmental requirements of this grapefern? Are specific mycorrhizae necessary for its survival?	Ecophysiological monitoring and supporting laboratory work could provide information about the ecological requirements of this species that could be incorporated into management direction.
<i>Botrychium paradoxum</i>	What are the environmental requirements of this rare species?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable information about its environmental requirements and limiting factors. This information could be incorporated into management direction.
<i>Botrychium paradoxum</i>	What are the mycorrhizal requirements for this species? Are the same mycorrhizae present in geographically separated sites supporting this species?	Determination of the mycorrhizal associates of this species could explain its limited distribution. Assessment of the impacts of management activities on the essential mycorrhizae could provide valuable guidelines for management.

Species name	Research Need	Potential Application
<i>Botrychium paradoxum</i>	What are the responses of this species to impacts caused by unusually large Populations of wildlife, particularly elk? Impacts would include both grazing and trampling.	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing and trampling could provide valuable information for incorporation into management direction.
<i>Botrychium paradoxum</i>	What is the genetic "status" of this species? It usually occurs with several other <i>Botrychium</i> species (sympatric). Does genetic introgression threaten this species?	Determination of valid taxa within the genus <i>Botrychium</i> through genetic research might reduce the number of currently recognized taxa and greatly simplify the task of conserving these species through appropriate management decisions.
<i>Botrychium paradoxum</i>	What is the genetic relationship of this grapefern to other sympatric species?	Genetic studies could indicate whether this species is genetically unique or whether it arises spontaneously from hybridization between/among other species. Resolution of the genetic uniqueness should enable management guidelines to be developed.
<i>Botrychium paradoxum</i>	What is the genetic relationship of this species to the many other grapeferns with which it is sympatric?	Ecophysiological monitoring supported by laboratory studies of this rare species could provide valuable information regarding the genetic integrity (and validity) of the taxon. This information could be incorporated into management direction.
<i>Botrychium paradoxum</i>	What is the taxonomic status of this species? What are its genetic relationships with the other <i>Botrychium</i> species with which it frequently grows?	Resolution of the taxonomic status of this rare species through cytogenetic and electrophoretic genetic investigations should preclude the development of monitoring protocol and management direction?
<i>Botrychium paradoxum</i>	What seral stages provide optimal habitat for this species?	Trend and demographic monitoring in populations in different seral stages could provide valuable information relative to the dependency of the species upon a specific successional stage.
<i>Botrychium pedunculosum</i>	Is this species threatened by the invasion of exotic species? To what extent?	Trend monitoring in areas supporting the rare species proximal to areas have exotic species populations could provide valuable information on the rate of exotic spread and effects on the rare species. Management guidelines could incorporate this.
<i>Botrychium pedunculosum</i>	What are the mycorrhizal requirements for this rare species?	Laboratory and ecophysiological monitoring could provide information regarding the dependency of this rare species on specific mycorrhizae. This information could be incorporated into management direction.
<i>Botrychium pumicola</i>	Is the timing of timber harvest activities important in this species' response to timber harvest?	Trend and demographic monitoring in populations under different logging schedules could provide valuable information for incorporation into management guidelines.
<i>Botrychium pumicola</i>	To what extent is this species threatened by fire and/or fire suppression?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural and/or prescribed burning could provide information for incorporation into management direction.
<i>Botrychium pumicola</i>	To what extent is this species threatened by the encroachment of its habitat by lodgepole pine?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by lodgepole encroachment and its elimination could provide valuable information for incorporation into management direction.
<i>Botrychium pumicola</i>	What are the environmental requirements of this rare species? Does it need specific mycorrhizae?	Ecophysiological monitoring of populations could provide valuable information on the environmental requirements of this species including mycorrhizal relationships, shade requirements, etc.
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	How does alteration of the hydrology (channel construction) in the habitat of this variety of concern affect this plant?	Trend monitoring in areas impacted by or potentially impacted by alterations in the hydrologic regime could provide valuable information on the species' response to such activities. This information could be incorporated into management guidelines.

Species name	Research Need	Potential Application
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	How does this rare species respond to fire and/or fire suppression? Is the present day fuel load a threat to this species?	Trend monitoring of this rare species in conjunction with prescribed and/or natural fires could provide valuable information which could be incorporated into management direction.
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	How does this rare species respond to grazing activities?	Trend monitoring of populations historically, presently, and/or potentially impacted by grazing could provide valuable information which could be incorporated into management direction.
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	How does this rare species respond to recreational activities?	Trend monitoring of this rare species in populations historically, presently, and/or potentially impacted by recreational activities could provide valuable information for incorporation into management guidelines.
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	How does this rare species respond to seasonal rotation of grazing? Does spring grazing adversely impact this rare species?	Trend and demographic monitoring conducted under different seasonal rotations of grazing could provide valuable information which could be incorporated into management direction.
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	How does this rare species respond to seeding projects which put additional perennial grasses into its habitat?	Trend and demographic monitoring in populations historically, presently, or potentially impacted by such seeding prescriptions could provide valuable information for incorporation into management guidelines.
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	How is this variety of concern affected by grazing activities?	Trend monitoring in population areas known to be impacted or potentially impacted by grazing could provide valuable information upon which management direction could be formulated.
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	What are the effects of road construction/maintenance on this variety of concern?	Trend and demographic monitoring in areas impacted by or potentially impacted by road construction/maintenance could provide valuable information which could be incorporated into management direction?
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	What are the effects of timber harvest on this variety of concern? Are the casual observations that canopy opening benefits this plant correct?	Trend and demographic monitoring in areas impacted by or potentially impacted by timber harvest activities could provide valuable information which could be incorporated into management direction?
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	What is the genetic relationship between this variety and the variety <i>peckii</i> ?	Genetic studies including electrophoresis and the development of morphological keys not dependent upon sampling of the capsule could provide valuable information for refining the taxonomy of these two varieties.
<i>Calochortus longebarbatus</i> var. <i>peckii</i>	What is the genetic relationship between this variety and the variety <i>longebarbatus</i> ?	Genetic studies including electrophoresis and the development of morphological keys not dependent upon sampling of the capsule could provide valuable information for refining the taxonomy of these two varieties.
<i>Calochortus longebarbatus</i> var. <i>peckii</i>	How does this rare variety respond to competition from exotic species?	Trend monitoring in populations historically, presently, or potentially impacted by the invasion of exotics could provide valuable information for incorporation into management direction.
<i>Calochortus longebarbatus</i> var. <i>peckii</i>	How does this rare variety respond to competition from perennial sod-forming grasses introduced in seeding prescriptions?	Trend monitoring in populations historically, presently, or potentially impacted by seeding projects could provide valuable information for incorporation into management direction.
<i>Calochortus longebarbatus</i> var. <i>peckii</i>	How does this rare variety respond to fire and/or fire suppression?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by fire could provide valuable information which could be incorporated into management direction.
<i>Calochortus longebarbatus</i> var. <i>peckii</i>	How does this rare variety respond to grazing activities?	Trend monitoring in populations historically, presently, and/or potentially impacted by grazing could provide valuable information which could be incorporated into management direction.
<i>Calochortus longebarbatus</i> var. <i>peckii</i>	Is this rare variety threatened by road construction?	Trend monitoring in populations historically, presently, or potentially impacted by road construction activity could provide valuable information for incorporation into management guidelines.

Species name	Research Need	Potential Application
<i>Calochortus nitidus</i>	To what extent has this rare species been impacted by grazing?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing could provide valuable information for management direction.
<i>Calochortus nitidus</i>	To what extent has this rare species been impacted by the application (direct and indirect) of herbicides?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the application of herbicides (direct and/or indirect) could provide valuable information for management direction.
<i>Calochortus nitidus</i>	To what extent has this rare species been impacted by the conversion of its habitat to agricultural production?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by agricultural conversion could provide valuable information for management direction.
<i>Calochortus nitidus</i>	To what extent is this rare species threatened by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for management direction.
<i>Calochortus nitidus</i>	To what extent is this species threatened by agricultural conversion of its native habitat?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the conversion of habitat for agricultural production could provide valuable information which could be incorporated into management direction.
<i>Calochortus nitidus</i>	To what extent is this species threatened by grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Calochortus nitidus</i>	To what extent is this species threatened by the invasion of exotic species?	Historic sites should be thoroughly inventoried with special data collected on the presence of exotic species. This species is thought to have been extirpated from the state of Washington. Management guidelines can be formulated accordingly.
<i>Camissonia pygmaea</i>	To what extent is this species threatened by the encroachment of exotic species, particularly annual grasses that are part of seeding prescriptions?	Trend and demographic monitoring in populations impacted by or proposed to be impacted by exotic species could provide valuable information for the formulation of management guidelines.
<i>Camissonia pygmaea</i>	To what extent is this species threatened by the excavation of rock material (gravel pit development) from its habitat?	Trend and demographic monitoring in populations impacted by or proposed to be impacted by mining activities (gravel pit excavation) could provide valuable information for the formulation of management guidelines.
<i>Camissonia pygmaea</i>	What are the impacts of grazing, particularly trampling, on this annual species of concern?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Camissonia pygmaea</i>	What are the impacts to this species by the direct and indirect application of herbicides?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the direct and/or indirect application of herbicides could provide valuable information which could be incorporated into management direction.
<i>Camissonia pygmaea</i>	What are the pollinators of this species and are they adversely affected by the application of insecticides used in agriculture?	Trend and demographic monitoring in populations impacted by or proposed to be impacted by the application of insecticides should provide information for the formulation of management guidelines.
<i>Carex lenticularis</i> var. <i>dolia</i>	What are the population dynamics of this variety of concern? Are population numbers stable?	Implement a monitoring project that will tract population dynamics of this variety of concern. This would also help assess grazing effects.

Species name	Research Need	Potential Application
<i>Carex lenticularis</i> var. <i>dolia</i>	Does grazing, particularly by sheep, adversely affect this variety of concern?	Implement a monitoring program to assess the effects of grazing on the species of concern.
<i>Carex lenticularis</i> var. <i>dolia</i>	What environmental factors affect recruitment of this variety of concern? What dispersal mechanism is involved? What are the germination requirements?	Gaining an understanding of the ecological requirements of this variety of concern--dispersal, germination, and conditions for improved recruitment--could conserve the variety.
<i>Carex lenticularis</i> var. <i>dolia</i>	Does the variety exhibit genetic integrity or is genetic introgression by a common variety altering its gene pool?	Opportunity to determine genetic purity of the variety of concern and to determine its genetic relationships with more common varieties.
<i>Carex parryana</i> ssp. <i>idahoensis</i>	What is the response of the subspecies of concern to intensive grazing activity?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
<i>Carex parryana</i> ssp. <i>idahoensis</i>	What is the geographic amplitude of this subspecies?	Inventory for this species could provide valuable information on population sizes and geographic amplitude. This information could be incorporated into management direction.
<i>Castilleja chlorotica</i>	To what extent is this species threatened by the invasion of its habitat by exotic species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management direction.
<i>Castilleja chlorotica</i>	To what extent is this species threatened by fire and/or fire suppression?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide information for incorporation into management direction.
<i>Castilleja chlorotica</i>	To what extent is this species threatened by grazing by domestic animals?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing of domestic animals could provide information for incorporation into management direction.
<i>Castilleja chlorotica</i>	What are the environmental requirements of this rare species?	Ecophysiological monitoring of populations could provide valuable information on the environmental requirements of this species including pollinators, seed banks, etc.
<i>Castilleja chlorotica</i>	What are the impacts of timber harvest activities to this rare species?	Trend and demographic monitoring in populations historically, presently, and/or potentially threatened by timber harvest activity could provide valuable information for incorporation into management guidelines.
<i>Castilleja chlorotica</i>	What is its genetic "status" and how does it differ from <i>C. glandulifera</i> and <i>C. viscidula</i> ?	Genetic investigations including electrophoresis could validate this taxon.
<i>Castilleja chlorotica</i>	What is the host-parasite relationship of this species?	Ecophysiological monitoring of populations could provide valuable information on the environmental requirements of this species including host/parasite relationships.
<i>Castilleja christii</i>	To what extent is this rare species threatened by road construction and/or road maintenance?	Trend and demographic monitoring of the single known population in response to road construction/maintenance activities could provide valuable information which could be incorporated into management direction.
<i>Castilleja cryptantha</i>	To what extent is this rare species threatened by animal damage, particularly from lagomorphs and rodents?	Trend and demographic monitoring of this rare species in habitats historically, presently, and/or potentially impacted by animal damage could provide information for incorporation into management direction.
<i>Castilleja cryptantha</i>	To what extent is this rare species threatened by recreational activity?	Trend and demographic monitoring of this rare species in habitats historically, presently, and/or potentially impacted by recreational activity could provide information for incorporation into management direction.

Species name	Research Need	Potential Application
Castilleja cryptantha	What are the environmental requirements and limiting factors of this rare species?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements and limiting factors. This information could be valuable in formulating monitoring and management direction.
Castilleja pilosa var. steenensis	To what extent is this species affected by grazing activities? Is its response to sheep grazing and cattle grazing different?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing could provide valuable information which could be incorporated into management direction.
Castilleja pilosa var. steenensis	What are the effects of roads on this species?	This species apparently responds favorably to road construction and/or maintenance. Trend monitoring could document this benefit and management direction could reflect this relationship.
Castilleja pilosa var. steenensis	What is the symbiotic relationship of this variety to the shrubs of its habitat? Which shrubs is it hemiparasitic with?	Ecophysiological monitoring could elucidate the relationships of this species with the shrubs of its habitat. This information could be incorporated into management direction, particularly as it concerns the host species.
Castilleja pilosa var. steenensis	What is the taxonomic relationship of this variety to C. pilosa var. pilosa?	Resolution of the taxonomy status of this "variety" precludes the development of monitoring and/or management guidelines.
Castilleja rubida	To what extent is this rare species threatened by the impacts of introduced big horn sheep and/or mountain goats?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by introduced sheep and goats could provide valuable information for incorporation into management guidelines.
Chaenactis cusickii	Are inventory efforts for this species adequate, particularly in Oregon?	Inventory for this rare species could provide valuable information on population sizes, locations, and geographic distribution. This information could be incorporated into management direction.
Chaenactis cusickii	How is this rare species affected by fire suppression activities, particularly those that disturb the soil?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by fire suppression activities (especially line construction) could provide valuable information for incorporation into management direction.
Chaenactis cusickii	How is this rare species affected by grazing activities, and particularly trampling by domestic livestock?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by grazing and trampling could provide information for incorporation into management direction.
Chaenactis cusickii	To what extent is this rare species threatened by exotic species, including those introduced in seedling prescriptions.	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide information which could be incorporated into management guidelines.
Chaenactis cusickii	To what extent is this rare species threatened by mining activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide information which could be incorporated into management guidelines.
Chaenactis cusickii	To what extent is this species impacted by recreational activities, particularly the use of off-road vehicles?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities (ORV's) could provide valuable information for management direction.
Chaenactis cusickii	To what extent is this species threatened by recreational activities, particularly by off-road vehicular traffic?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities, and especially off road vehicle impacts could provide valuable information for incorporation into management guidelines.

Species name	Research Need	Potential Application
<i>Chaenactis cusickii</i>	To what extent is this species threatened by road construction and/or road maintenance?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by road construction and/or road maintenance activities could provide valuable information for incorporation into management guidelines.
<i>Chaenactis cusickii</i>	What are the environmental requirements and limiting factors of this species?	Ecophysiological and demographic monitoring of this species could provide valuable information on its environmental requirements and limiting factors. This information could be incorporated into management direction.
<i>Chaenactis cusickii</i>	What are the environmental requirements of this species?	Ecophysiological monitoring of this species could provide valuable information on its environmental requirements and limiting factors. This information could be incorporated into management direction.
<i>Chrysothamnus parryi</i> ssp. <i>montanus</i>	What are the environmental requirements and limiting factors of this rare species?	Ecophysiological, trend, and demographic monitoring could provide information on the environmental requirements of this species. This information could be incorporated into management direction.
<i>Chrysothamnus parryi</i> var. <i>montanus</i>	What are the pollinating agents for this species of concern?	Trend, demographic, and ecophysiological monitoring of this species could provide valuable information on its environmental requirements and limiting factors. This information could be used in management.
<i>Chrysothamnus parryi</i> var. <i>montanus</i>	What is the population trend of this species?	Trend monitoring could provide valuable information on the population dynamics and trend of this species. This information could be incorporated into management direction.
<i>Chrysothamnus parryi</i> var. <i>montanus</i>	How will this species respond to increased grazing pressure caused by the reintroduction of bighorn sheep and by mountain goats?	Trend and demographic monitoring in populations impacted by herbivory of big horn sheep and mountain goats could provide valuable information for incorporation into management direction.
<i>Claytonia lanceolata</i> var. <i>flava</i>	What is the taxonomic "status" of this species?	Resolution of the taxonomic status of the var. <i>flava</i> especially in relationship to <i>C. rosea</i> and <i>C. multiscapa</i> should preclude the development of monitoring protocol and management direction.
<i>Claytonia umbellata</i>	To what extent is this species threatened by aggressive exotic species, particularly annual grasses frequently included in seeding prescriptions?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Claytonia umbellata</i>	To what extent is this species threatened by excavation activities, especially gravel pit development and or enlargement?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by mining (gravel pit excavation) could provide valuable information which could be incorporated into management direction.
<i>Collomia mazama</i>	To what extent is this rare species affected by fire, particularly the role of fire in maintaining an open canopy?	Trend, demographic, and ecophysiological monitoring documenting this species' responses to the impacts of prescribed or natural fires could provide information for incorporation into management direction.
<i>Collomia mazama</i>	To what extent is this rare species affected by grazing?	Trend, demographic, and ecophysiological monitoring documenting this species' responses to grazing activities could provide valuable information for incorporation into management documents.
<i>Collomia mazama</i>	To what extent is this rare species affected by recreational activities?	Trend monitoring in populations of this rare species impacted by or potentially impacted by recreational activities could provide valuable information for incorporation into management direction.
<i>Collomia mazama</i>	To what extent is this rare species beneficially affected by timber harvest?	Trend monitoring of populations of this rare species impacted by or potentially impacted by timber harvest activities could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Collomia renata</i>	To what extent is this rare species threatened by exotic species?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by exotic species could provide information for incorporation into management direction.
<i>Collomia renata</i>	To what extent is this rare species threatened by road construction activities?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by road construction/maintenance could provide valuable information for incorporation into management direction.
<i>Cynopteris nivalis</i>	Is road construction a potential threat to this rare species?	Trend and demographic monitoring in populations threatened by road construction could provide valuable information which could be incorporated into management direction.
<i>Cypripedium fasciculatum</i>	Are inventories for this species adequate, particularly on private lands adjacent to known populations?	Inventory for this rare species could provide valuable baseline information on its population sizes and geographic distribution. This information could be used in the development of monitoring and management strategies.
<i>Cypripedium fasciculatum</i>	How does this rare species respond to grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing could provide valuable information for incorporation into management guidelines.
<i>Cypripedium fasciculatum</i>	How does this species respond to fire and/or fire suppression? Is seasonality of burning important?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by fire and/or fire suppression could provide valuable information which could be incorporated into management direction.
<i>Cypripedium fasciculatum</i>	How is this rare species affected by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide valuable information which could be incorporated into management direction.
<i>Cypripedium fasciculatum</i>	Is this species still present in the single isolated site within the Columbia Basin?	Inventory for this species could provide valuable information on its population sizes and distribution. This information could be used in the development of monitoring and management guidelines.
<i>Cypripedium fasciculatum</i>	To what extent is this rare species affected by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for use in the development of management direction.
<i>Cypripedium fasciculatum</i>	To what extent is this rare species affected by timber harvest activities? In particular, how does this species respond to opening of the canopy and changes in its light regime?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by timber harvest activities could provide valuable information for use in the development of management direction.
<i>Cypripedium fasciculatum</i>	To what extent is this species affected by fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by fire, fire suppression, excessive fuel loading, etc., could provide valuable information for management.
<i>Cypripedium fasciculatum</i>	To what extent is this species affected by increased recreational traffic precipitated by improved access (road construction)?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened road construction and increased recreational use could provide information for management.
<i>Cypripedium fasciculatum</i>	To what extent is this species affected by timber harvest activity?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by timber harvest activities could provide valuable information for incorporation into management direction.
<i>Cypripedium fasciculatum</i>	What are the environmental requirements for this rare species? Are specific mycorrhizal species essential for its survival?	Ecophysiological monitoring could provide valuable information on the environmental requirements of this rare species.

Species name	Research Need	Potential Application
<i>Cypripedium fasciculatum</i>	What are the environmental requirements for this rare species? What are its pollinators, its mycorrhizal requirements?	Trend, demographic, and ecophysiological monitoring of this species could provide valuable baseline information about its environmental requirements and limiting factors.
<i>Cypripedium fasciculatum</i>	What are the pollinators of this species of concern?	The sporadic distribution of this species indicates an unusual type of pollination biology. Understanding this biology could ensure that management decisions will not adversely impact that species.
<i>Cypripedium fasciculatum</i>	What are the pollinators of this species? Why is its occurrence so sporadic across its documented range?	Ecophysiological monitoring could provide valuable information regarding the population dynamics of this rare species. This information could be incorporated into management direction.
<i>Cypripedium fasciculatum</i>	What are the responses of this species to changes in the light regime? Particularly, how does the species respond to logging activities that result in an opening of the canopy?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the opening of the canopy associated with timber harvest could provide valuable information for management.
<i>Cypripedium fasciculatum</i>	What threat does timber harvest pose to this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by timber harvest activity could provide information which could be incorporated into management direction.
<i>Cypripedium fasciculatum</i>	Will this species tolerate alteration of the subterranean hydrology of the habitat in which it grows?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by alterations in the subterranean hydrology could provide valuable information for incorporation into management direction.
<i>Cypripedium fasciculatum</i>	Will this species tolerate timber harvest activities that alter the light regime by opening the canopy?	Trend monitoring in populations historically, presently, or potentially impacted by the opening of the canopy associated with timber harvest activities could provide valuable information for incorporation into management direction.
<i>Cypripedium fasciculatum</i>	What are the mycorrhizal requirements for this species of concern and how do management practices, particularly those that disturb the soil, affect those mycorrhizae?	Determination of the mycorrhizal associates of this species and their responses to management activities could provide valuable information for incorporation into management direction.
<i>Delphinium viridescens</i>	How is this rare species affected by development?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by development could provide valuable information which could be incorporated into management direction.
<i>Delphinium viridescens</i>	How is this rare species affected by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide valuable information which could be incorporated into management direction.
<i>Delphinium viridescens</i>	How is this rare species affected by grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Delphinium viridescens</i>	How is this rare species affected by the invasion of exotic species including those deliberately seeded?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Delphinium viridescens</i>	How is this rare species affected by timber harvest activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by timber harvest activities could provide information that could be incorporated into management direction.

Species name	Research Need	Potential Application
<i>Delphinium viridescens</i>	How do exotic plant species effect this taxa?	Trend monitoring of populations threatened by the invasion of exotics could provide valuable information for incorporation into management direction.
<i>Delphinium viridescens</i>	What are the effects of fire and/or fire suppression on this rare species?	Trend and demographic monitoring in populations historically, presently, or potentially impacted by natural or prescribed burning could provide valuable information for incorporation into management guidelines.
<i>Delphinium viridescens</i>	What are the effects of grazing on this rare species?	Trend and demographic monitoring of populations impacted by the trampling of domestic livestock could provide valuable information for incorporation into management direction.
<i>Descurainia torulosa</i>	Is this a valid taxon?	Resolution of the taxonomic status of this species should preclude the development of monitoring and management strategy.
<i>Douglasia idahoensis</i>	How is this species impacted by fire and/or fire suppression? Is the extent of fuel loading critical to its survival through catastrophic fires?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by fire, fire suppression, excessive fuel loading, etc., could provide valuable information for management.
<i>Draba trichocarpa</i>	To what extent is this rare species threatened by housing development in its habitat?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by housing development could provide information which could be incorporated into management direction.
<i>Draba trichocarpa</i>	What is the taxonomic relationship of this rare species to sympatric and/or taxonomically "close" relatives such as <i>Draba paysonii</i> var. <i>treleasei</i> ?	Resolution of taxonomic "status" and relationship should preclude the development of monitoring protocol and management guidelines.
<i>Erigeron basalticus</i>	Does gravel pit excavation pose a threat to the viability of this rare species?	Trend and demographic of populations historically, presently, and or potentially impacted by gravel pit excavation could provide valuable information for incorporation into management guidelines.
<i>Erigeron basalticus</i>	How has road construction diminished the habitat of this rare species? Are proposed road construction projects a threat to existing populations?	Trend monitoring and an analysis of historic potential habitat could provide valuable information regarding the impacts of road construction on this rare species.
<i>Erigeron basalticus</i>	What are the effects of herbicidal drift on this rare species?	Trend and demographic of populations historically, presently, and or potentially impacted the direct and/or indirect application of agricultural herbicides could provide valuable information for incorporation into management guidelines.
<i>Erigeron basalticus</i>	What is the reproductive biology of this species and how does it affect its geographic amplitude?	Trend, demographic, and ecophysiological monitoring of this species could provide valuable baseline information on its environmental requirements and limiting factors.
<i>Erigeron lackschewitzii</i>	Is this species being adversely impacted by wildlife, particularly bighorn sheep?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by wildlife (bighorn sheep) could provide valuable information for incorporation into management direction.
<i>Erigeron lackschewitzii</i>	Is this species threatened by the invasion of exotic species? To what extent have exotics diminished the natural habitat of this species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management direction.
<i>Erigeron lackschewitzii</i>	To what extent is wind dispersal of the seeds of this species a factor in its limited geographic distribution?	Determination of the dispersal mechanisms of this species could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Erigeron lackschewitzii</i>	What is the genetic status of this species? Is introgression by more common species a threat to its viability?	Determination of the natural genetic variation of this species and comparisons with sympatric populations could determine whether the genetic integrity of the species is threatened by introgression.
<i>Erigeron lackschewitzii</i>	To what extent does the geographical amplitude of this species extend west of the continental divide? What is the geographical amplitude of the species?	Determination of the exact geographic amplitude would enable management direction consistent with the conservation of the species to be formulated in areas where known populations of the species occur.
<i>Erigeron latus</i>	To what extent is this rare species threatened by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management guidelines.
<i>Erigeron latus</i>	To what extent is this rare species threatened by the proposed designation of its habitat as a U.S. Airforce bombing range?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by a change in land use (conversion to bombing range) could provide valuable information which could be incorporated into management direction.
<i>Erigeron salmonensis</i>	To what extent is this rare species threatened by global warming trends?	Long term trend monitoring could provide information on the species' response to global warming. Artificial seed banking could be employed to conserve genetic material if the species faces extinction.
<i>Eriogonum chrysops</i>	Are inventories for this rare species adequate? What are the population sizes and geographic amplitude of this species?	Inventory of the potential habitat of this species to document its geographic amplitude and population sizes is essential for the development of a monitoring strategy for assessing the impacts of management activities.
<i>Eriogonum chrysops</i>	To what extent is this rare species impacted by the application of herbicides conducted in conjunction with sagebrush eradication?	Trend and demographic monitoring in sites historically, presently, and/or potentially impacted by herbicide application could provide valuable information for incorporation into management guidelines.
<i>Eriogonum crosbyae</i>	What are the environmental requirements of this species?	Ecophysiological monitoring of this species could provide valuable information about its environmental requirements. This information could be incorporated into management guidelines.
<i>Eriogonum crosbyae</i>	What is the taxonomic status of this species? Is it distinct from <i>E. prociduum</i> ? Is it threatened by hybridization with <i>E. prociduum</i> ?	Cytogenetic and electrophoretic laboratory analysis could help resolve the taxonomic "status" and threats from hybridization. This information should preclude the development of monitoring and management guidelines.
<i>Eriogonum cusickii</i>	Is this rare species threatened by the invasion of exotic species?	Trend and demographic of populations historically, presently, and/or potentially threatened by the invasion of exotic species could provide valuable information which could be incorporated into management guidelines.
<i>Eriogonum cusickii</i>	What are the environmental requirements for this rare species?	Ecophysiological monitoring of this rare species could provide valuable information for incorporation into management direction.
<i>Eriogonum meledonum</i>	What are the population dynamics of this species? Is recruitment problematic?	Ecophysiological monitoring of this species could provide information on its environmental requirements and population dynamics. This information could be valuable for the development of monitoring protocol and management direction.
<i>Eriogonum novonudum</i>	What are the impacts of grazing by bighorn sheep on this species?	Trend and demographic monitoring of populations historically, presently, and potentially threatened by bighorn sheep could provide valuable information which could be incorporated into management direction.
<i>Eriogonum novonudum</i>	What are the impacts of recreational activity on this species?	Trend and demographic monitoring of populations historically, presently, and potentially threatened by recreational activities could provide valuable information which could be incorporated into management direction.

Species name	Research Need	Potential Application
<i>Eriogonum prociduum</i>	To what extent is this rare species threatened by mining activities?	Trend monitoring in populations of this rare species impacted by or potentially impacted by mining activities could provide valuable information for incorporation into management guidelines.
<i>Eriogonum prociduum</i>	To what extent is this rare species threatened by recreational activities, particularly the use of off road vehicles?	Trend monitoring in populations of this rare species impacted by or potentially impacted by recreational activities, particularly the use of orv's, could provide valuable information for incorporation into management guidelines.
<i>Eriogonum prociduum</i>	To what extent is this rare species threatened by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide information which could be incorporated into management direction.
<i>Eriogonum prociduum</i>	What is the reproductive biology of this rare species? Why is recruitment so low? How extensive is vegetative versus sexual reproduction?	Ecophysiological monitoring and supporting laboratory work could provide valuable information about the reproductive biology of this rare species. This information could be used in the development of management strategy.
<i>Erythronium grandiflorum</i> var. <i>nudipetalum</i>	To what extent has the historic habitat of this rare species been affected by grazing?	Trend and demographic monitoring of populations historically, presently, and or potentially threatened by grazing activities could provide valuable information about grazing and diminished habitat.
<i>Griatiola heterosepala</i>	To what extent is this species impacted by grazing activities?	Trend and demographic monitoring in populations historically, presently, and potentially impacted by grazing could provide valuable information for incorporation into management guidelines.
<i>Griatiola heterosepala</i>	What are the environmental requirements for this species?	Ecophysiological monitoring of this species could provide valuable information for incorporation into management guidelines.
<i>Grindelia howellii</i>	How extensively distributed is this species in its native habitat rather than artificial habitats created by human disturbance? Is its native habitat grasslands or in draw-down zones of prairie ponds?	Trend monitoring of the status of populations in natural versus disturbed sites could enable predictive modeling of population responses to various management activities.
<i>Grindelia howellii</i>	To what extent has this rare species been impacted by the invasion of exotics?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotics could provide valuable information for incorporation into management direction.
<i>Grindelia howellii</i>	Why does this species not occupy potential habitat, particularly along the st. Maries river?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements. This information could be incorporated into management direction.
<i>Hackelia cronquistii</i>	Has the inventory effort for this species been adequate in Idaho?	Inventory for this species could document population sizes and geographic amplitude of this species. This baseline information could be incorporated into monitoring protocol and management guidelines.
<i>Hackelia cronquistii</i>	To what extent is this species dependent upon fire and the attendant reduction of fuel load created by exotic species like cheatgrass?	Ecophysiological monitoring could provide valuable information on this rare species' dependency upon periodic fire. This information could be incorporated into management direction.
<i>Hackelia cronquistii</i>	What are the effects of grazing on this rare species?	Trend and demographic monitoring could provide valuable information on this species' response to grazing. This information could be incorporated into management guidelines.
<i>Hackelia cronquistii</i>	What are the effects of recreational activities, particularly the use of off-road vehicles, on this rare species?	Trend and demographic monitoring in populations historically, presently, and potentially threatened by recreational activities could provide valuable information for incorporation into management guidelines.

Species name	Research Need	Potential Application
Hackelia cronquistii	What are the environmental requirements of this species? What are its limiting factors?	Ecophysiological monitoring of this rare species could provide valuable information which could be incorporated into monitoring protocol and management direction.
Hackelia cronquistii	Would fire adversely affect this species by converting shrubland to grassland?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire and/or fire suppression could provide information for incorporation into management direction.
Hackelia venusta	To what extent is this rare species threatened by road maintenance (sanding) activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by road sanding activities could provide information that could be incorporated into management direction.
Hackelia venusta	What are the environmental requirements of this species? What are its limiting factors?	Trend, demographic, and ecophysiological monitoring of this species could provide valuable baseline information on the environmental requirements and/or limiting factors of this species. This information could be used in management.
Hackelia venusta	What is the taxonomic status of this species? Is it really two different taxa?	Resolution of the taxonomic status of this species could provide valuable baseline information which could preclude the development of management direction.
Haplopappus insecticuriis	To what extent is this rare species threatened by herbicidal application, both direct and indirect?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by herbicides could provide valuable information which could be incorporated into management direction.
Haplopappus insecticuriis	To what extent is this rare species threatened by the conversion of its habitat to agricultural production?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by agricultural conversion could provide information that could be incorporated into management direction.
Haplopappus insecticuriis	What are the environmental requirements of this species? What are its limiting factors?	Trend, demographic, and ecophysiological monitoring of this rare species could provide information on its environmental requirements. This information could be incorporated into management direction.
Haplopappus liatiriformis	How has this rare species been affected by changes in the fire regime?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by fire, fire suppression, and/or changes in the fire regime could provide valuable information which could be incorporated into management direction.
Haplopappus liatiriformis	To what extent has natural habitat been diminished by conversion to agricultural production? Does agricultural conversion pose a threat to known populations?	Trend monitoring of known populations proximal to existing agricultural lands or lands proposed for conversion to agricultural production should provide valuable information for the development of management direction.
Haplopappus liatiriformis	To what extent is this rare species threatened by exotic species?	Trend and demographic monitoring in populations threatened by exotic species could provide valuable information for incorporation into management direction.
Haplopappus liatiriformis	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring in populations threatened by grazing activities could provide valuable information for incorporation into management direction.
Haplopappus liatiriformis	To what extent is this rare species threatened by the conversion of its habitat to agricultural production?	Trend and demographic monitoring in populations threatened by agricultural conversion could provide valuable information for incorporation into management direction.
Haplopappus liatiriformis	To what extent is this species threatened by the encroachment of its habitat by exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by the invasion of exotic species could provide valuable information which could be incorporated into management direction.

Species name	Research Need	Potential Application
<i>Haplopappus llatriformis</i>	What is the reproductive biology of this rare species?	Demographic and ecophysiological monitoring of known populations could provide valuable information on the reproductive biology of this species. Management guidelines could be formulated accordingly.
<i>Haplopappus radius</i>	Is this a valid taxon?	Resolution of the taxonomic status of this taxa precludes the development of monitoring protocol and management guidelines for it.
<i>Haplopappus radius</i>	Is this taxon valid? What is the relationship of this species to <i>Haplopappus carthamoides</i> ?	The resolution of the taxonomic status of this species could provide valuable information which could be incorporated into management direction.
<i>Haplopappus radius</i>	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Haplopappus radius</i>	To what extent is this rare species threatened by grazing activities?	Trend, demographic, and ecophysiological monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management guidelines.
<i>Haplopappus radius</i>	To what extent is this rare species threatened by grazing?	Trend and demographic monitoring of populations of this rare species historically, presently, and/or potentially impacted by grazing could provide information for incorporation into management direction.
<i>Haplopappus radius</i>	To what extent is this rare species threatened by road construction and/or maintenance?	Trend and demographic monitoring of populations of this rare species historically, presently, and/or potentially impacted by road construction and/or maintenance could provide valuable information for incorporation into management direction.
<i>Haplopappus radius</i>	To what extent is this rare species threatened by the encroachment of exotic species into its habitat?	Trend and demographic monitoring of populations of this rare species historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management direction.
<i>Haplopappus uniflorus</i> var. <i>howellii</i>	To what extent is this species adversely impacted by recreational activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activity (especially trampling) could provide valuable information for incorporation into management direction.
<i>Howellia aquatilis</i>	How is this rare species affected by natural aquatic succession or by accelerated eutrophication?	Trend, demographic, and ecophysiological monitoring of this species in habitats undergoing seral transition could provide valuable information on this potential threat. Management guidelines could be developed accordingly.
<i>Howellia aquatilis</i>	Is genetic uniformity problematic for this species? Has the lack of genetic variability in this species been scientifically documented?	Genetic studies of this species across its range could determine the uniformity of its gene pool and predict its vulnerability. This information could be incorporated into management direction.
<i>Howellia aquatilis</i>	Is inventory information adequate? Has the lower Coeur d'Alene river been inventoried for this rare species?	Inventory for this rare species could document population sizes and geographic amplitude. This information could be used in the development of monitoring protocol and management direction.
<i>Howellia aquatilis</i>	To what extent does timber harvest threaten this species, particularly in exposing its habitat to increased evapotranspiration?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by timber harvest activities could provide information that could be incorporated into management direction.

Species name	Research Need	Potential Application
<i>Howellia aquatilis</i>	To what extent is this rare species threatened by housing development projects within its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by housing development could provide valuable information for incorporation into management direction.
<i>Howellia aquatilis</i>	To what extent is this rare species threatened by the alteration of the hydrologic regime underlying its supporting habitat? Is housing development problematic?	Trend and demographic of populations historically, presently, and/or potentially impacted by housing development that alters the hydrologic regime of habitat could provide valuable information for incorporation into management guidelines.
<i>Howellia aquatilis</i>	To what extent is this species threatened by the encroachment of its habitat by exotic species, particularly reed canary grass?	Trend monitoring of known habitat relative to encroachment by exotics could provide valuable information relative to this threat. Management direction (Phalaris eradication?) could be developed accordingly.
<i>Howellia aquatilis</i>	What are the environmental requirements for this rare species, particularly those factors associated with seed production, viability, and recruitment?	Demographic and ecophysiological monitoring of this species could provide valuable information on all aspects in the life cycle of this poorly-understood rare species. This information could be incorporated into management guidelines.
<i>Howellia aquatilis</i>	What is the role of ungulates in dispersing this species? How is this finding correlated with the sporadic distribution of the species in areas with potential habitat?	Assessment of the role of ungulates in dispersing the seeds of this species of concern could resolve management issues related to grazing.
<i>Howellia aquatilis</i>	What are the long term effects of extreme hydrologic variation on the species of concern? What are the impacts of management practices to the hydrologic regime?	Determination of effects of different management practices on both the hydrologic regime and the populations of the species of concern would enable management direction to be developed.
<i>Iliamna longisejala</i>	Are the populations of this rare species east of the cascade mountains, and particularly in Douglas County, Washington, adequately inventoried? Is the actual geographic amplitude of this species known?	Inventory for this rare species could provide valuable information about Population sizes and geographic distribution. This information could be incorporated into management direction.
<i>Iliamna longisejala</i>	How does this species respond to fire? Are casual observations that the species benefits from frequent low-intensity burns correct?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by fire, fire suppression, and/or changes in the fire regime could provide valuable information which could be incorporated into management direction.
<i>Iliamna longisejala</i>	What is the response of this species of concern to direct and indirect effects of herbicides?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the direct and/or indirect application of herbicides could provide valuable information which could be incorporated into management direction.
<i>Ivesia rhypara</i> var. <i>rhypara</i>	To what extent is this species threatened by grazing activities and the associated trampling of grazing animals?	Trend and demographic monitoring in populations historically, presently, and/or potentially threatened by grazing activities could provide information which could be incorporated into management activities.
<i>Ivesia rhypara</i> var. <i>rhypara</i>	To what extent is this species threatened by road construction and/or road maintenance?	Trend and demographic monitoring in populations historically, presently, and/or potentially threatened by road construction could provide information which could be incorporated into management activities.
<i>Ivesia rhypara</i> var. <i>rhypara</i>	To what extent is this species threatened by the invasion of its habitat by exotic species?	Trend and demographic monitoring in populations historically, presently, and/or potentially threatened by exotic species could provide information which could be incorporated into management activities.
<i>Ivesia rhypara</i> var. <i>rhypara</i>	What are the environmental requirements of this rare species? What are its limiting factors?	Ecophysiological monitoring and supporting laboratory work could provide information on the environmental requirements of this species. This information could be incorporated into management guidelines.

Species name	Research Need	Potential Application
<i>Ivesia rhypara</i> var. <i>shellyi</i>	What are the environmental requirements of this rare species? What are its limiting factors?	Ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements. This information could be incorporated into management direction.
<i>Ivesia rhypara</i> var. <i>shellyi</i>	What is the systematic relationship of this variety to the variety <i>rhypara</i> ? Are they genetically distinct taxa?	Resolution of the systematic relationship of the two varieties could provide valuable information on the genetic variability of the species and its evolutionary stature. This information could be incorporated into management guidelines.
<i>Lepidium davisi</i>	How is this rare species impacted by the grazing and trampling activities of wild horses?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by wild horse trampling and/or grazing could provide valuable information for incorporation into management guidelines.
<i>Lepidium davisi</i>	Is <i>Iva axillaris</i> displacing this rare species?	Trend monitoring in populations supporting both the rare species and <i>Iva axillaris</i> could provide valuable information for incorporation into management direction.
<i>Lepidium davisi</i>	To what extent is this rare species threatened by alteration of the hydrology supporting its habitat?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted activities which alter the underlying hydrology could provide valuable information which could be incorporated into management direction.
<i>Lepidium davisi</i>	To what extent is this rare species threatened by the invasion of its habitat by exotic species, particularly Russian thistle?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by exotic species could provide information which could be incorporated into management direction.
<i>Lepidium davisi</i>	What are the environmental requirements of this species? What are its limiting factors?	Ecophysiological monitoring could provide valuable information about the environmental requirements and limiting factors of this species. This information could be incorporated into monitoring protocol and management direction.
<i>Lepidium papilliferum</i>	What are the effects of exotic species, including deliberate introductions, on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management direction.
<i>Lepidium papilliferum</i>	What are the effects of fire and/or fire suppression on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by natural and/or prescribed burning could provide information for incorporation into management direction.
<i>Lepidium papilliferum</i>	What are the effects of grazing activities on this species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
<i>Lepidium papilliferum</i>	What are the environmental requirements of this rare species? What are its limiting factors?	Ecophysiological monitoring of this species could provide valuable baseline information on the environmental requirements and limiting factors of this species. This information could be used in the development of monitoring protocol and management.
<i>Leptodactylon glabrum</i>	To what extent is this rare species threatened by dam construction, specifically hydroelectric dam construction on the Bruneau River?	Trend and demographic monitoring in populations where habitat has been altered by inundation, construction, and/or altered hydrology could provide valuable information on the responses of this species to such activities.
<i>Leptodactylon glabrum</i>	What are the environmental requirements of this species? What are its limiting factors?	Ecophysiological monitoring of this rare species could provide valuable baseline information on its environmental requirements and limiting factors. This information could be used in the development of monitoring protocol and management direction.

Species name	Research Need	Potential Application
<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	Is this a valid taxon? Could genetic and electrophoretic studies confirm differences with the parental progenitor?	Resolution of the taxonomic status of this species should preclude the development of monitoring guidelines and management direction.
<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	To what extent is this rare species threatened by the direct and/or indirect application of herbicides?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by herbicides (direct and/or drift) could provide valuable information which could be incorporated into management direction.
<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	To what extent is this species threatened by recreational activities?	Trend and demographic monitoring in populations historically, presently, or potentially impacted by recreational activities (including trail construction) could provide valuable information for incorporation into management direction.
<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	What is the basic reproductive biology of this rare subspecies?	Ecophysiological monitoring could provide valuable information on pollinators, seed set, seed viability, soil requirements, etc. That could be incorporated into management direction.
<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	Why is the recruitment rate apparently low in this subspecies?	Ecophysiological and demographic monitoring could provide valuable information on pollinators, seed set, seed viability, soil requirements, etc. That could be incorporated into management direction.
<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	Are inventories for this rare species adequate in Idaho? In Oregon?	Inventory for this rare species could provide valuable information on population sizes, locations, and geographic distribution. This information could be used in the development of monitoring and management strategy.
<i>Lesquerella (pulchella) sp. novum</i>	Is the species threatened by increased mining activity?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could be useful to management.
<i>Lesquerella (pulchella) sp. novum</i>	What are the effects of exotic species (spotted knapweed) on this species? How has the species responded to springtime treatment of the adjacent exotic species with herbicides?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species and/or the herbicides used in their control could be useful to management.
<i>Lesquerella (pulchella) sp. novum</i>	What are the population trends for this species?	Trend monitoring for the known populations of this species should provide information relative to the impacts of mining, grazing, and wildlife. This information can be incorporated into management guidelines to ensure the conservation of the species.
<i>Lesquerella carinata</i>	Has this species received adequate inventory effort in Wyoming?	Inventory conducted for this species could provide valuable information on its population sizes and geographic amplitude. This valuable information could be incorporated into monitoring protocol and management direction.
<i>Lesquerella carinata</i> var. <i>languida</i>	What are the effects of grazing on the species of concern?	Assessment of the impacts of grazing on the known populations of this species through monitoring would enable the development of management direction consistent with the conservation of the species.
<i>Lesquerella carinata</i> var. <i>languida</i>	What are the specific edaphic requirements of this species and do these requirements cause its constrained geographic amplitude?	Determination of the chemical and physical characteristics of the soils within the known populations of this species of concern could enable predictive modeling of potential habitat and the development of management direction.
<i>Lesquerella carinata</i> var. <i>languida</i>	Why is the geographic amplitude of this species of concern so limited? Why is the amplitude confined to the garnet range in west-central Montana?	Assessment of the true geographic amplitude of this species of concern would enable the issue of edaphic endemism to be resolved. Management direction for the known populations could then be formulated.

Species name	Research Need	Potential Application
<i>Lesquerella carinata</i> var. <i>languida</i>	Are exotic species (spotted knapweed) diminishing the populations and/or range of this species of concern?	Assessment of the impacts of exotic plant species (especially spotted knapweed) on the species of concern would enable the development of management direction consistent with the conservation of the species.
<i>Lesquerella humilis</i>	Does this species of concern have a specific edaphic requirement that determines its distribution?	Determination of all chemical and physical characteristics of the soils at sites of known populations would enable predictive modeling of potential habitat and enable management direction to be formulated consistent with the conservation of the species.
<i>Lesquerella humilis</i>	How does this species of concern respond to disturbance? How is this species affected by recreational use, particularly hiking?	Assessment of the impact on this species of concern by the potential threat of recreational usage and development through monitoring could be incorporated into management direction.
<i>Lesquerella humilis</i>	What is the geographic amplitude of this species of concern?	The determination of the overall geographic amplitude of this species would enable management direction consistent with the conservation of this species to be developed.
<i>Lesquerella humilis</i>	What is the reproductive biology of the species of concern? What is the dispersal mechanism of the species?	Determination of the dispersal aspect of the reproductive biology could yield an understanding of the distributional limits of this species of concern and enable the development of management direction.
<i>Lesquerella paysonii</i>	Do exotic species (especially knapweed) pose a threat to this species of concern?	Assessment of the effects of exotic species upon the species of concern through monitoring could enable management direction to be formulated.
<i>Lesquerella paysonii</i>	Does this species of concern exhibit affinity for a specific soil type?	Determination of the chemical and physical characteristics of the soil in which this single population grows would enable predictive modeling of potential habitat and the development of management direction.
<i>Lesquerella paysonii</i>	Has the taxonomic validity of the identification of the specimens from the single population in Montana been determined?	Resolution of the taxonomic status of the Montana plants should preclude the development of any management opportunities or directions concerning this species.
<i>Lesquerella paysonii</i>	Have inventory efforts for this species been adequate in Wyoming?	Inventory for this species could provide valuable information on population sizes and geographic amplitude. This information should preclude the development of monitoring and management strategies.
<i>Lesquerella paysonii</i>	What are the environmental requirements of this rare species? What are its limiting factors?	Ecophysiological monitoring of this rare species could provide valuable baseline information on its environmental requirements and limiting factors. This information could be incorporated into monitoring protocol and management direction.
<i>Lesquerella paysonii</i>	What is the population trend of this species of concern?	Assessment of the population trend of the single population known to occur in Montana would enable management direction to be developed.
<i>Lomatium "ochocensis"</i>	What are the population sizes and geographic amplitude of this newly described taxon?	Inventory for this newly described species in high potential habitat could provide baseline information which could be used in the development of monitoring plans against which the effects of management activities could be measured.
<i>Lomatium erythrocarpum</i>	To what extent is this rare species threatened by wildlife, particularly mountain goats and big horn sheep?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the grazing activities of wildlife could provide information for incorporation into management guidelines.
<i>Lomatium erythrocarpum</i>	What are the population sizes and geographic amplitude of this rare species?	Inventory efforts conducted for this species particularly in the Elkhorn mountains could provide valuable baseline information for the development of monitoring plans and management direction.

Species name	Research Need	Potential Application
Lomatium greenmanii	What are the impacts of grazing by wild and domestic species to this rare species?	Trend monitoring in populations historically, presently, or potentially impacted by grazing could provide valuable information which could be incorporated into management direction.
Lomatium greenmanii	What are the impacts of recreational activities (trampling by tramway customers) to this rare species?	Trend and demographic monitoring could provide valuable information which could be incorporated into management direction.
Lomatium suksdorfii	Have inventory efforts for this species been adequate?	Inventory for this rare species could provide valuable baseline information on population sizes and geographic distribution. This information could be used in the development of monitoring and management strategy.
Lomatium suksdorfii	Is there a potential threat as the medicinal values of this species are determined and demand for it increases?	Trend and demographic of populations historically, presently, and or potentially impacted native harvest (for medicinal purposes) could provide information for incorporation into management guidelines.
Lomatium suksdorfii	To what extent do exotic species threaten this rare species?	Trend monitoring of known populations of this rare species known to be impacted by the invasion of exotic species could provide valuable information for incorporation into management direction.
Lomatium suksdorfii	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
Lomatium suksdorfii	To what extent is this rare species impacted by mining activities including gravel pit excavation and quarrying?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide valuable information which could be incorporated into management direction.
Lomatium suksdorfii	To what extent is this rare species impacted by the direct and/or indirect application of herbicides?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by herbicide application could provide information which could be incorporated into management direction.
Lomatium suksdorfii	What are the effects of grazing on this rare species?	Trend, demographic, and ecophysiological monitoring could provide information on the basic biological requirements of this rare species. This information could be incorporated into management direction.
Lomatium suksdorfii	What are the limiting environmental factors that cause the geographic amplitude of this species to be so constrained?	Trend, demographic, and ecophysiological monitoring of this species could provide valuable information about its environmental requirements and limiting factors. This information could be incorporated into management direction.
Lomatium suksdorfii	What is the amplitude of this rare species?	Inventory conducted for this rare species could determine its geographic amplitude and delineate populations suitable for monitoring. This information is essential for the development of management guidelines.
Lomatium tuberosum	Is excavation of gravel pits (crushed basal) a threat to this rare species?	Trend monitoring could provide valuable information regarding the effects of excavation on this rare species. This information could be incorporated into management guidelines.
Lomatium tuberosum	To what extent does damage caused by foraging rodents threaten this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by wild animal species could provide information which could be incorporated into management direction.
Lomatium tuberosum	To what extent does harvest of this rare species by native Americans for food purposes pose a threat to this plant?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by native harvest (for food purposes) could provide valuable information which could be incorporated into management direction.

Species name	Research Need	Potential Application
Lomatium tuberosum	To what extent is this rare species threatened by recreational activities, particularly those of petrified wood collectors who frequently alter the habitat of this species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide information which could be incorporated into management direction.
Lomatium tuberosum	What are the sizes of known populations and what is the true geographic amplitude of the species?	Inventory for this rare species could provide valuable information on population sizes and geographic distribution of this species.
Lomatium tuberosum	What is the reproductive biology of this rare species? How dependent is this species on crustose lichens for nutrient cycling and availability?	Trend, demographic, and ecophysiological monitoring of this species could provide valuable information about its environmental requirements and limiting factors. This information could be incorporated into management direction.
Luina serpentina	Is the lack of genetic variability problematic for this species?	Laboratory research focused on genetic variability of this rare species could provide valuable information about the basic biology of the species?
Luina serpentina	To what extent is this rare species threatened by road construction projects?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by road construction activities could provide valuable information which could be incorporated into management direction.
Luina serpentina	To what extent is viable seed production involved in the population dynamics of this species?	Ecophysiological monitoring and supporting laboratory research could document low seed viability of the species. This information could be incorporated into management direction.
Lupinus biddlei	How is this rare species impacted by gold mining activities?	Trend monitoring in populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for incorporation into management direction.
Lupinus biddlei	How is this rare species impacted by the invasion of seeded and non-seeded exotic species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the invasion of seeded or non-seeded exotic species could provide valuable information for incorporation into management direction.
Lupinus biddlei	Is this a valid taxon?	Resolution of the taxonomic status of this species through cytogenetic and electrophoretic methods should preclude the development of management direction concerning this taxa.
Lupinus biddlei	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information which could be incorporated into management guidelines.
Lupinus cusickii	How is this rare species impacted by recreational activity?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities (and particularly off-road vehicles) could provide valuable information for incorporation into management direction.
Lupinus cusickii	What is the taxonomic status of this "species"?	Resolution of the taxonomic status of this rare taxa precludes the development of any type of monitoring studies and/or management direction.
Meconella oregana	Are annual exotics threatening this species?	Trend monitoring in populations impacted by and/or potentially impacted by exotic species could provide valuable information that could be incorporated into management direction.

Species name	Research Need	Potential Application
Meconella oregana	Are the populations and geographic amplitude of this rare species known? Have inventory efforts been sufficient?	Inventory for this species could provide baseline information on its population sizes and distributions. This information could be used in the development of monitoring and management guidelines.
Meconella oregana	Have inventory efforts for this rare species been adequate?	Inventory for this rare species could provide information on population sizes and geographic distribution. This baseline information could be useful in the development of monitoring and management strategy.
Meconella oregana	How is this species affected by grazing activities?	Trend monitoring in populations impacted by and/or potentially impacted by grazing could provide valuable information that could be incorporated into management direction.
Meconella oregana	To what extent is this rare species impacted by activities which alter the hydrologic regime supporting its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by activities which alter the hydrologic regime could provide valuable information which could be incorporated into management direction.
Meconella oregana	To what extent is this rare species impacted by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
Meconella oregana	To what extent is this rare species impacted by recreational activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide information which could be incorporated into management direction.
Meconella oregana	To what extent is this rare species impacted by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotics species could provide valuable information which could be incorporated into management direction.
Meconella oregana	What are the environmental requirements for this species? What are its limiting factors?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable information on the environmental requirements and limiting factors of this species. This baseline information could be incorporated into management direction.
Mentzelia mollis	To what extent are inventories for this species adequate, particularly in Nevada?	Inventory for this species could document the sizes of its populations and geographic amplitude. This baseline information could be used in the formulation of management guidelines.
Mentzelia mollis	To what extent is this rare species threatened by exotic species, including those included in seeding prescriptions?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion or deliberate introduction of exotic species could provide valuable information which could be incorporated into management direction.
Mentzelia mollis	To what extent is this rare species threatened by mechanical disruption of its habitat associated with fire suppression activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire suppression activities could provide valuable information which could be incorporated into management guidelines.
Mentzelia mollis	To what extent is this rare species threatened by mining activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide information which could be incorporated into management guidelines.
Mentzelia mollis	To what extent is this rare species threatened by mining activities? How successful are efforts to use it in the restoration of mining sites?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Mentzelia mollis</i>	To what extent is this rare species threatened by recreational activities, particularly the use of off road vehicles?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activity, particularly off-road vehicles, could provide valuable information for incorporation into management guidelines.
<i>Mentzelia mollis</i>	To what extent is this rare species threatened by the invasion of exotic species and the competition that results from such an invasion?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management guidelines.
<i>Mentzelia mollis</i>	What are the environmental requirements of this rare species?	Ecophysiological monitoring of this rare species could provide valuable baseline information on its environmental requirements and limiting factors. This information could be used in developing monitoring protocol and management direction.
<i>Mentzelia mollis</i>	What are the environmental requirements of this rare species? What is the extent of its seed bank? What factors are involved in the dispersal of its seeds?	Ecophysiological monitoring of this rare species could provide valuable information on its environmental requirements and limiting factors. This information could be incorporated into management direction.
<i>Mentzelia packardiae</i>	To what extent is this rare species adversely impacted by grazing activities?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by grazing activities could provide information for incorporation into management direction.
<i>Mentzelia packardiae</i>	To what extent is this rare species adversely impacted by the invasion of exotic species?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by exotic species could provide information for incorporation into management direction.
<i>Mentzelia packardiae</i>	What environmental factors prevent this species from occupying all of its potential habitat?	Ecophysiological monitoring of populations of this rare species could provide valuable information about its environmental requirements--pollinators, seed banks, soil factors, dispersal modes, etc. This information could be incorporated into management.
<i>Mimulus clavicola</i>	What are the environmental requirements for this species? What are its soil moisture requirements? Its pollinators? Its seed bank?	Ecophysiological monitoring could provide valuable information about the basic biology of this species. This information could be incorporated into management direction.
<i>Mimulus clavicola</i>	What are the impacts of exotic species on this species of concern?	Trend monitoring in populations threatened by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Mimulus clavicola</i>	What are the impacts of grazing to this species of concern?	Trend and demographic monitoring of populations impacted by grazing activities could provide valuable information for incorporation into management direction.
<i>Mimulus clavicola</i>	What are the impacts of road construction to this species of concern? Does road construction increase available habitat for this species?	Trend and demographic monitoring in populations impacted by road construction projects could provide valuable information that could be incorporated into management direction.
<i>Mimulus clavicola</i>	What are the impacts of timber harvest activities on this species of concern?	Trend monitoring in populations historically, presently, and/or potentially impacted by timber harvest activities could provide valuable information which could be incorporated into management direction.
<i>Mimulus clavicola</i>	What monitoring protocol is most appropriate for this annual species that exhibits extreme populations annually?	The development of suitable monitoring methods could provide valuable monitoring information for measuring the impacts of management activities.

Species name	Research Need	Potential Application
Mimulus evanescens	How do alterations in the hydrologic regime affect this rare species?	Trend and demographic monitoring in populations impacted by or potentially impacted by reservoir draw-down or other alterations in the hydrologic regime could provide valuable information for incorporation into management direction.
Mimulus evanescens	To what extent is this rare species threatened by grazing activities?	Trend monitoring in populations of this rare species impacted by or potentially impacted by grazing could provide valuable information for incorporation into management guidelines.
Mimulus evanescens	What is the geographic amplitude of this newly-described rare species?	Inventory for this rare species could provide valuable information on population sizes, locations, and geographic range of the species. This information could be used in the development of management and monitoring guidelines.
Mimulus jungermannii	Have seed banking efforts been conducted to ensure the survival of this species? How important is seed production in the propagation of this rhizomatous species?	Seed banking success could result in an increase in available seed which could enable the species to be used in restoration work.
Mimulus jungermannii	How is this species affected by agricultural endeavors and the changes in the water table that sometimes are associated with them?	Trend and demographic monitoring of populations growing in areas in which the hydrologic regime has been, is, or will be altered by agricultural endeavors could provide valuable information which could be incorporated into management direction.
Mimulus jungermannii	How is this species affected by grazing activities and the changes in the water table that sometimes are associated with it?	Trend and demographic monitoring of populations growing in areas in which the hydrologic regime has been, is, or will be altered by grazing activities could provide valuable information which could be incorporated into management direction.
Mimulus jungermannii	To what extent has the natural habitat of this rare species been diminished by the construction of hydroelectric dams and fluctuations in pool levels?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the construction of hydroelectric dams and/or by fluctuations in pool levels could provide valuable information useful for management.
Mimulus jungermannii	To what extent is this rare species threatened by excavation activities, particularly gravel pit development?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by mining (gravel pit excavation) could provide information for incorporation into management direction.
Mimulus jungermannii	To what extent is this rare species threatened by the direct and/or indirect application of herbicides?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the direct application of herbicides (roadside weed control) and/or indirect application (drift) could provide valuable information for management.
Mimulus jungermannii	To what extent is this species of moist basaltic crevices affected by alteration of the hydrologic regime?	Trend monitoring in populations of this rare species impacted by or potentially impacted by changes in the hydrologic regime could provide valuable information on the species' response to alterations in hydrology.
Mimulus jungermannii	To what extent is this species threatened by both direct and indirect application of herbicides? How can county weed control crews be kept from spraying roadside populations?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the direct and/or indirect application of agricultural herbicides could provide valuable information for incorporation into management direction.
Mimulus jungermannii	To what extent is this species threatened by excavation activities?	Trend monitoring in populations impacted by or potentially impacted by excavation (gravel pit or mining activities) could provide valuable information for incorporation into management guidelines.

Species name	Research Need	Potential Application
<i>Mimulus jungermannioides</i>	What is the extent of the natural seed bank of this species? Is vegetative or sexual reproduction of greater importance in maintaining its populations?	Ecophysiological monitoring and supporting laboratory/greenhouse work could provide information on the basic reproductive biology of this species. This information could be incorporated into management direction.
<i>Mimulus jungermannioides</i>	What variation in the genetics of this species occurs? How is gene flow maintained within populations?	Genetic variability could be investigated in the laboratory and gene flow could be determined by ecophysiological monitoring. This information on the biological requirements of the species could be used in the formulation of management direction.
<i>Mimulus patulus</i>	Has inventory for this species been adequate? Has this species been extirpated from Idaho?	Inventory for this rare species could provide valuable information on its population sizes, locations, and geographic distribution. This information could be used in the development of management and monitoring strategy.
<i>Mimulus pygmaeus</i>	Is this rare species benefited by the trampling of ungulates?	Trend, demographic, and ecophysiological monitoring in populations impacted by or potentially impacted by trampling by grazing animals could provide information on the beneficial aspects ("capsule burying") of trampling.
<i>Mimulus pygmaeus</i>	To what extent is this species threatened by changes in the hydrologic regime?	Trend monitoring of populations impacted by or potentially impacted by activities that alter the hydrologic regime could provide valuable information for incorporation into management direction.
<i>Mimulus pygmaeus</i>	To what extent is this species threatened by seeding projects that introduce perennial species into its habitat?	Trend monitoring of populations impacted by or potentially impacted by seed prescriptions which include perennial species could provide valuable information for incorporation into management guidelines, particularly the formulation of seed prescriptions.
<i>Mimulus pygmaeus</i>	To what extent is this species threatened by the invasion of exotic species?	Trend monitoring in populations threatened by the invasion of exotic species could provide valuable information on the rate of invasion and effects of invasion by exotic species. This information could be incorporated into management direction.
<i>Mimulus washingtonensis</i> var. <i>washingtonensis</i>	Does grazing adversely affect this species by selectively favoring an increase in a pollen competitor ( <i>Mimulus guttatus</i> )?	Ecophysiological monitoring could provide valuable information for determining the indirect role of grazing in depressed seed set caused by increasing populations of a pollen competitor. This information could be incorporated into management direction.
<i>Mimulus washingtonensis</i> var. <i>washingtonensis</i>	Does this rare species have a "cold" requirement for germination? Does this adversely affect its ability to compete with sympatric species?	This rare species reportedly has a "cold" requirement that lessens its ability to compete (through pollination) with <i>Mimulus guttatus</i> . Laboratory investigations could determine if this requirement is a limiting factor.
<i>Mimulus washingtonensis</i> var. <i>washingtonensis</i>	To what extent is this species adversely affected by seeding prescriptions which include annual grasses?	Trend monitoring in populations impacted by or potentially impacted by seeding projects could provide valuable information for incorporation into management guidelines.
<i>Mimulus washingtonensis</i> var. <i>washingtonensis</i>	To what extent is this species threatened by the encroachment of habitat by exotic species? Do seeding prescriptions contribute to this threat?	Trend and demographic monitoring in populations impacted by the invasion of exotic species or by seeding projects which prescribe annual brome grasses could provide valuable information for incorporation into management direction.
<i>Mimulus washingtonensis</i> var. <i>washingtonensis</i>	Was the Nachez river population properly identified?	Collection of a voucher specimen and submission to an appropriate regional herbarium for the verification of identification should preclude the development of monitoring and management strategies.

Species name	Research Need	Potential Application
Mimulus washingtonensis var. washingtonensis	What is the extent of the natural seed bank and is it sufficiently replenished in wet years?	Ecophysiological monitoring and supporting laboratory work could provide valuable information on the seed bank size and viability. This information could be incorporated into management direction.
Mimulus washingtonensis var. washingtonensis	To what extent is this species threatened by activities which alter the hydrologic regime?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by activities which alter the hydrologic regime could provide valuable information which could be incorporated into management direction.
Mimulus washingtonensis var. washingtonensis	To what extent is this species threatened by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
Mirabilis bigelovii var. retorsa	Are inventories for the occurrence of this variety adequate?	Inventory activities could document population sizes and determine geographic amplitude. Both of these parameters are essential in developing monitoring and management strategy.
Mirabilis bigelovii var. retorsa	How is this variety genetically different from the typovar?	The genetic and taxonomic status of this variety could be determined by electrophoretic studies. This information could be incorporated into management direction.
Mirabilis macfarlanei	How is this rare species affected by grazing activities?	Trend monitoring in populations historically, presently, or potentially impacted by grazing could provide valuable information which could be incorporated into management direction.
Mirabilis macfarlanei	How is this rare species affected by road construction and/or maintenance?	Trend and demographic monitoring of populations threatened by road construction and/or maintenance could provide valuable information on the effects of these activities on the rare species. This information could be incorporated into management direction.
Mirabilis macfarlanei	How is this rare species affected by the invasion of exotic species?	Trend and demographic monitoring of populations threatened by exotic species could provide valuable information on the invasion rate and adverse effects of exotics.
Mirabilis macfarlanei	Is the full extent of this species' populations and geographic amplitude known?	Inventory for this species could provide valuable information on its population sizes, locations, and the geographic range of the species. This information could be used in management direction.
Mirabilis macfarlanei	To what extent is this rare species threatened by livestock grazing activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information which could be incorporated into management direction.
Mirabilis macfarlanei	To what extent is this species parasitized by fungi? Does this relationship diminish vigor, seed production, etc.?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fungal infection could provide valuable information for incorporation into management direction.
Mirabilis macfarlanei	What are the environmental requirements for this rare species?	Ecophysiological monitoring of this rare species could provide valuable information about its environmental requirements. This information could be incorporated into management guidelines.
Mirabilis macfarlanei	What is the role of asexual (vegetative) reproduction and what degree of genetic variability occurs within populations and across the range of this rare species?	Ecophysiological monitoring and supporting laboratory work could provide information about the genetic variability of this rare species. This information could be incorporated into management guidelines.

Species name	Research Need	Potential Application
<i>Oenothera psammophila</i>	What are the environmental requirements and limiting factors of this rare species?	Ecophysiological monitoring of this rare species could provide valuable baseline information on its environmental requirements and limiting factors. This information could be incorporated into monitoring protocol and management direction.
<i>Oryzopsis (Achnatherum) hendersonii</i>	Is this rare species adversely affected by recreational activities, specifically the use of off-road vehicles?	Trend and demographic monitoring of populations historically, presently, and or potentially impacted by Recreational activities could provide valuable information for incorporation into management direction.
<i>Oryzopsis (Achnatherum) hendersonii</i>	What is the relationship of this rare species to mycorrhizae or other cryptogamic species?	Demographic monitoring should enable the determination of such relationship. Management direction relative to the findings could then be developed.
<i>Oryzopsis (Achnatherum) hendersonii</i>	What is the reproductive biology of this rare species? Why is recruitment so limited?	Trend, demographic, and ecophysiological monitoring could provide baseline information about the environmental requirements of this species. This information could be incorporated into management direction.
<i>Oryzopsis contracta</i>	What are the demographic trends of this species?	Trend and demographic monitoring of this rare species could provide valuable information which could be incorporated into management guidelines.
<i>Oryzopsis hendersonii</i> var. <i>hendersonii</i>	To what extent are the population sizes and geographic amplitude of this species known?	Inventory for this rare species could provide valuable information on the population sizes and geographic distribution of this species. This information could be used to develop monitoring plans to facilitate proper management.
<i>Oryzopsis hendersonii</i> var. <i>hendersonii</i>	To what extent is this rare species adversely affected by grazing?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Oryzopsis hendersonii</i> var. <i>hendersonii</i>	To what extent is this rare species impacted by excavation activities, particularly gravel pit development?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by excavation projects could provide information which could be incorporated into management direction.
<i>Oryzopsis hendersonii</i> var. <i>hendersonii</i>	To what extent is this rare species impacted by fire and/or fire suppression activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural or prescribed burning could provide valuable information which could be incorporated into management direction.
<i>Oryzopsis hendersonii</i> var. <i>hendersonii</i>	To what extent is this rare species impacted by road construction or maintenance activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by road construction and/or maintenance activities could provide valuable information which could be incorporated into management direction.
<i>Oryzopsis hendersonii</i> var. <i>wallowensis</i>	To what extent are the population sizes and geographic amplitude of this species known?	Inventory for this rare species could provide valuable information on the population sizes and geographic distribution of this species. This information could be used to develop monitoring plans to facilitate proper management.
<i>Oryzopsis hendersonii</i> var. <i>wallowensis</i>	To what extent is this rare species adversely affected by grazing?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Oryzopsis hendersonii</i> var. <i>wallowensis</i>	To what extent is this rare species impacted by excavation activities, particularly gravel pit development?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by excavation projects could provide information which could be incorporated into management direction.

Species name	Research Need	Potential Application
<i>Oryzopsis hendersonii</i> var. <i>wallowensis</i>	To what extent is this rare species impacted by fire and/or fire suppression activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by natural or prescribed burning could provide valuable information which could be incorporated into management direction.
<i>Oryzopsis hendersonii</i> var. <i>wallowensis</i>	To what extent is this rare species impacted by road construction or maintenance activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by road construction and/or maintenance activities could provide valuable information which could be incorporated into management direction.
<i>Oxytropis campestris</i> var. <i>columbiana</i>	Is this variety of concern threatened by residential development?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by housing development could provide valuable information for incorporation into management guidelines.
<i>Oxytropis campestris</i> var. <i>columbiana</i>	What are the germination requirement for this variety of concern? How does it become established in areas of high wave action?	Conduct studies to determine germination requirements and monitor known populations to determine recruitment rates and mechanisms of establishment. Enables limiting factors to be identified and treated in management prescriptions.
<i>Oxytropis campestris</i> var. <i>columbiana</i>	Is the variety of concern taxonomically valid? Can molecular studies (isozymes) help resolve this taxonomic question?	Resolution of taxonomic status through cytogenetic and electrophoretic investigations precludes the development of monitoring protocol and management direction.
<i>Oxytropis campestris</i> var. <i>wanapum</i>	Do exotic species threaten this rare variety?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Oxytropis campestris</i> var. <i>wanapum</i>	Has this rare variety been adequately inventoried to determine its populations and geographic amplitude?	Inventory for this rare species could provide valuable information about its population sizes and geographic distribution.
<i>Oxytropis campestris</i> var. <i>wanapum</i>	Is the reproductive biology and population dynamics of this rare variety adequately understood?	Trend, demographic, and ecophysiological monitoring could provide valuable baseline information about the environmental requirements and limiting factors of this species.
<i>Oxytropis campestris</i> var. <i>wanapum</i>	Is this rare variety threatened by recreational activities, particularly hang-gliding?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide information which could be incorporated into management direction.
<i>Oxytropis campestris</i> var. <i>wanapum</i>	Is this rare variety threatened by the construction of microwave and television towers in its habitat on ridgetops?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by housing and other development could provide valuable information which could be incorporated into management direction.
<i>Papaver pygmaeum</i>	What is the taxonomic relationship between this species and <i>Papaver radicum</i> ?	Resolution of the taxonomic relationship between <i>p. Pygmaeum</i> and <i>p. Radicum</i> is necessary to validate the "concern" status of this taxon.
<i>Papaver pygmaeus</i>	What are the population dynamics of this species of concern?	Monitoring known populations could enable determination of dynamics and identification of potential threats (although known populations are in protected areas).
<i>Parnassia kotzebuei</i> var. <i>pumila</i>	Have inventory efforts on this rare species been adequate?	Inventory for this rare species could provide valuable baseline information on population sizes and geographic distribution. This information could be incorporated into management direction and the development of monitoring strategy.

Species name	Research Need	Potential Application
<i>Parnassia kotzebuei</i> var. <i>pumila</i>	Is this a valid taxon? What is its relationship with sympatric species?	Resolution of the taxonomic status and relationship of this variety of concern should preclude the development of monitoring and management strategy.
<i>Parnassia kotzebuei</i> var. <i>pumila</i>	To what extent is this variety of concern threatened by mining activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide information which could be incorporated into management direction.
<i>Parnassia kotzebuei</i> var. <i>pumila</i>	To what extent is this variety of concern threatened by natural geologic changes such as landslides?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by natural geologic phenomena could provide valuable information which could be incorporated into management direction.
<i>Parnassia kotzebuei</i> var. <i>pumila</i>	What are the environmental requirements of this species?	Trend, demographic, and ecophysiological monitoring could provide valuable information about the environmental requirements and limiting factors for this rare species. This baseline information could be incorporated into management guidelines.
<i>Penstemon barrettiae</i>	Does hybridization with other more common species threaten the genetic integrity of this species? Does this problem exist throughout the range of the species?	Genetic studies in sympatric populations could provide valuable information on the genetic integrity and threats of this species. This information could be incorporated into management direction.
<i>Penstemon barrettiae</i>	How are natural populations of this rare species maintained in the vertical cliff habitat?	Ecophysiological monitoring of this rare species could provide valuable information on how the species colonizes the vertical cliff habitat and could also identify restoration opportunities. This information could be incorporated into management guidelines.
<i>Penstemon barrettiae</i>	Is this rare species threatened by alterations in the hydrologic regime of its habitat?	Trend monitoring in populations impacted by or potentially impacted by alterations in the hydrologic regime could provide valuable information for incorporation into management guidelines.
<i>Penstemon barrettiae</i>	To what extent has the known geographic range of this rare species been inventoried for populations of this species?	Inventory for this species could provide valuable information on population sizes and geographic distribution. This information could be used in the development of monitoring and management guidelines.
<i>Penstemon barrettiae</i>	To what extent have artificial seed banking efforts been successful?	Evaluation of seed banking efforts and outplanting success could provide valuable information which could be incorporated into management direction.
<i>Penstemon barrettiae</i>	To what extent is genetic dilution threatening the species in areas where its distribution is sympatric with other species, particularly <i>Penstemon fruticosus</i> ?	Genetic studies coupled with demographic monitoring of sympatric populations could provide valuable information relative to genetic dilution and introgression. This information could be incorporated into management direction.
<i>Penstemon barrettiae</i>	To what extent is this attractive rare species threatened by collectors, particularly <i>Penstemon</i> growers?	Trend monitoring in populations impacted by and/or potentially impacted by collection could provide valuable information for incorporation into management guidelines.
<i>Penstemon barrettiae</i>	To what extent is this rare species impacted by the direct and/or indirect application of herbicides?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the direct (roadside weed control) and/or indirect (drift) application of herbicides could provide valuable information for management.
<i>Penstemon barrettiae</i>	To what extent is this rare species threatened by mining (excavation) activity?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by excavation activities could provide valuable information which could be incorporated into management guidelines.

Species name	Research Need	Potential Application
<i>Penstemon barrettiae</i>	What are the environmental factors that constrain the geographic amplitude of this rare species?	Demographic and ecophysiological monitoring of populations across the range of the species could provide valuable baseline information on its environmental requirements and geographic amplitude.
<i>Penstemon barrettiae</i>	What are the impacts of road construction on the habitat of this rare species and its known populations?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by road construction activities (including blasting) could provide valuable information for incorporation into management direction.
<i>Penstemon barrettiae</i>	What is the impact of collection ("taking") of specimens of this rare species on its populations and geographical amplitude? Is the horticulture industry threatening this species?	Trend monitoring throughout the range of this rare species should provide baseline information on the impacts of plant collecting on this species. Management direction could be formulated according to the results.
<i>Penstemon barrettiae</i>	Why is the recruitment rate so low in this species?	Trend and demographic monitoring of this rare species could provide valuable information assessing the low recruitment rate. This information could be incorporated into management direction.
<i>Penstemon glaucinus</i>	To what extent is this rare species threatened by fire and/or fire suppression activities?	Trend monitoring in populations historically impacted by, presently impacted by, or potentially impacted by prescribed or natural fire could provide valuable information which could be incorporated into management direction.
<i>Penstemon glaucinus</i>	To what extent is this rare species threatened by the excavation of road building materials?	Trend monitoring in populations impacted by or potentially impacted by the excavation of road bed materials could provide valuable information for the formulation of management guidelines?
<i>Penstemon idahoensis</i>	To what extent is this rare species threatened by the invasion or seeding of exotic species?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by exotics species (including those in seeding prescriptions) could provide valuable information for management.
<i>Penstemon idahoensis</i>	What are the environmental requirements of this rare species? What are its limiting factors?	Ecophysiological monitoring of this rare species could provide valuable baseline information on its environmental requirements and limiting factors. This information could be incorporated into monitoring protocol and management direction.
<i>Penstemon lemhiensis</i>	Are exotic species a serious threat to this species of concern?	Assessment of the effects of the invasion of exotic species (knapweed) through the monitoring of known populations would enable management direction and effective control measures consistent with the conservation of the species to be developed.
<i>Penstemon lemhiensis</i>	How does this rare species respond to competition from exotic species? Are any of these competitors included in seeding prescriptions?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide information for incorporation into management direction.
<i>Penstemon lemhiensis</i>	How does this rare species respond to fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire, fire suppression, or changes in the fire regime could provide valuable information for incorporation into management direction.
<i>Penstemon lemhiensis</i>	How does this species respond to habitat disturbance, particularly the creation of road cuts?	Assessment of population dynamics in disturbed habitats through monitoring could enable management direction consistent with the conservation of the species to be formulated.
<i>Penstemon lemhiensis</i>	To what extent is this rare species threatened by collection for horticultural purposes?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by plant collectors could provide valuable information for incorporation into management direction.

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Species name	Research Need	Potential Application
<i>Penstemon lemhiensis</i>	What are the effects of grazing on this species?	Assessment of the impacts of grazing through monitoring plots, could enable management direction to be determined.
<i>Penstemon lemhiensis</i>	What are the environmental requirements of this rare species and what are its limiting factors?	Ecophysiological monitoring of this rare species could provide baseline information on its environmental requirements and limiting factors. This information could be used in the formulation of monitoring protocol and management direction.
<i>Penstemon lemhiensis</i>	What are the reproductive dynamics of the known populations of this species?	Assessment of population parameters of germination, longevity, seed viability, pollination success, etc., through monitoring would provide valuable information on the viability threshold of this species.
<i>Penstemon lemhiensis</i>	What are the responses of this species to a prescribed fire regime? What are the responses of this species to fire suppression?	Assessment of the effects of fire, both prescribed and natural, could enable management direction to be developed consistent with the conservation of the species.
<i>Penstemon peckii</i>	What is the effect of alteration of the hydrologic regime on this rare species?	Trend monitoring in populations impacted by "dewatering" of subirrigated meadowlands could provide valuable information for incorporation into management direction.
<i>Penstemon peckii</i>	What is the effect of fire and/or fire suppression on this rare species?	Trend monitoring in populations impacted by natural or prescribed fire could provide valuable information which could be incorporated into management direction.
<i>Penstemon peckii</i>	What is the effect of population fragmentation caused by recreational activities or development?	Trend monitoring in populations historically, presently, and/or potentially fragmented by recreational activity could provide valuable information for incorporation into management direction.
<i>Perideridia erythrorhiza</i>	What genetic differences occur between eastside and westside populations?	Ecophysiological monitoring supported by laboratory work involving electrophoresis and cytogenetics could provide valuable information about genetic differences in the two populations. This information could be incorporated into management direction.
<i>Perideridia erythrorhiza</i>	Why is this species so rare while <i>Perideridia gairdneri</i> and <i>P. oregana</i> are much more abundant, even in the same habitat?	Ecophysiological monitoring of the sympatric species could provide valuable information on the dynamics of the populations. This information could be incorporated into management direction.
<i>Petrophytum cinerascens</i>	To what extent is this rare shrub threatened by plant collectors, and specifically collections for horticultural usage?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by plant collection activities for horticultural purposes could provide valuable information for management, particularly regarding permits.
<i>Petrophytum cinerascens</i>	To what extent is this rare shrub threatened by road construction projects which impact its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by road construction could provide valuable information which could be used in the development of management guidelines.
<i>Petrophytum cinerascens</i>	What are the environmental requirements of this rare species?	Demographic and ecophysiological monitoring of this rare species could provide valuable baseline information on the environmental requirements and limiting factors of this rare species. This information could be incorporated into management direction.
<i>Phacelia inconspicua</i>	To what extent has this annual species been impacted by fire and/or fire suppression?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Phacelia inconspicua</i>	To what extent has this annual species been impacted by mining?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for incorporation into management direction.
<i>Phacelia inconspicua</i>	What are the environmental requirements for this rare species? What are its limiting factors?	Ecophysiological monitoring of this rare species could provide valuable baseline information about its environmental requirements and limiting factors. This information could be useful in the formulation of monitoring protocol and management.
<i>Phacelia lenta</i>	To what extent is this species threatened by gravel excavation?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by mining (gravel pit excavation) activities could provide valuable information which could be incorporated into management direction.
<i>Phacelia lenta</i>	To what extent is this species threatened by herbicide drift?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by the direct and/or indirect application of herbicides could provide valuable information which could be incorporated into management direction.
<i>Phacelia lenta</i>	What is the reproductive biology of this species? Does this contribute to its narrow geographic amplitude?	Trend, demographic, and ecophysiological monitoring could provide valuable baseline information about the environmental requirements and limiting factors for this species.
<i>Phacelia minutissima</i>	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring of populations of this rare species historically, presently, and/or potentially impacted by grazing activities could provide valuable information which could be incorporated into management guidelines.
<i>Phlox idahonis</i>	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Phlox idahonis</i>	To what extent is this rare species threatened by the encroachment of its meadowland habitat by trees?	Trend and demographic monitoring could provide valuable information on tree encroachment into the habitat of this species. Effects of tree removal by logging and/or periodic fire could also be determined and used in management.
<i>Physaria didymocarpa</i> var. <i>lyrata</i>	To what extent is this rare variety threatened by mining activities?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for incorporation into management guidelines.
<i>Physaria integrifolia</i> var. <i>monticola</i>	Are the morphological characteristics used to assign varietal status environmentally, rather than genetically, induced?	Resolution of the taxonomic validity of this variety of concern should preclude the development of monitoring and management strategies.
<i>Physaria integrifolia</i> var. <i>monticola</i>	Is this a valid taxon?	Resolution of the taxonomic validity of this variety of concern should preclude the development of monitoring and management strategies.
<i>Pleuropogon oregonus</i> ( <i>Lophochlaena oregana</i> )	To what extent is this rare species threatened by alteration in the hydrological regime of its habitat and particularly by water diversion projects?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by hydrologic altering projects could provide information for incorporation into management direction.
<i>Pleuropogon oregonus</i> ( <i>Lophochlaena oregana</i> )	To what extent is this rare species threatened by fire and/or fire suppression activities?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by natural and/or prescribed burning could provide valuable information for incorporation into management direction.

Species name	Research Need	Potential Application
<i>Pleuropogon oregonus</i> ( <i>Lophochlaena oregana</i> )	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing could provide valuable information for incorporation into management guidelines.
<i>Pleuropogon oregonus</i> ( <i>Lophochlaena oregana</i> )	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by grazing could provide valuable information for incorporation into management direction.
<i>Pleuropogon oregonus</i> ( <i>Lophochlaena oregana</i> )	To what extent is this rare species threatened by the invasion of exotic species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by exotic species could provide valuable information for incorporation into management direction.
<i>Pleuropogon oregonus</i> ( <i>Lophochlaena oregana</i> )	What are the population sizes and geographic amplitude of this rare species, particularly in the grande ronde basin?	Inventory efforts for this species in the grande ronde basin could provide baseline information on the population sizes and potential threats to those populations as well as the geographic range of the species.
<i>Polemonium pectinatum</i>	To what extent is this rare species threatened by the invasion of exotic species?	Trend and demographic monitoring of this species should provide valuable information on the effects of exotic species on this rare species. This information could be incorporated into management guidelines for controlling the exotic species.
<i>Polemonium pectinatum</i>	To what extent is this species adversely affected by drift from herbicidal spraying?	Trend monitoring could provide valuable information regarding the responses of the species to herbicidal drift. This information could be incorporated into management direction concerning the use of herbicides in areas known to support the species.
<i>Polemonium pectinatum</i>	What are the effects of grazing on this rare species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Polemonium pectinatum</i>	What are the effects of water diversion associated with agricultural production on this rare species?	Trend and demographic monitoring in populations historically, presently, and/or potentially impacted by agricultural practices which alter the hydrology could provide valuable information for incorporation into management direction.
<i>Polemonium pectinatum</i>	What is the reproductive biology of this rare species?	Trend and demographic monitoring of this species should provide important information on seed viability, pollinators, seed bed, etc. This information is basic to understanding the rarity of the species and the development of management guidelines.
<i>Primula alcalina</i>	Has this rare species been adequately inventoried? What are the sizes of its populations and what is its geographic amplitude?	Inventory for this rare species could provide valuable baseline information which could be incorporated into monitoring protocol and management direction.
<i>Primula alcalina</i>	How is this rare species affected by exotic species?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Primula alcalina</i>	How is this rare species affected by grazing activities, particularly springtime grazing?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information about the effects of seasonal damage to this species.
<i>Primula alcalina</i>	How is this rare species affected by recreational activities?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by recreational activities (esp. Camping) could provide valuable information which could be incorporated into management direction.

Species name	Research Need	Potential Application
Ranunculus reconditus	Is this species a valid taxon? How does it differ genetically from Ranunculus glaberrimus?	Electrophoretic comparisons of R. reconditus and R. glaberrimus should resolve any taxonomic questions associated with the rare species. This information is basic to management decisions.
Ranunculus reconditus	To what extent has the historic habitat of this species been converted to agricultural production? Is this conversion still occurring?	Trend monitoring of populations historically, presently, and/or potentially impacted by agricultural conversion could provide information on habitat diminution for incorporation into management direction.
Ranunculus reconditus	To what extent is this rare species threatened by grazing?	Trend monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
Ranunculus reconditus	What are the specific habitat requirements of this rare species?	Ecophysiological monitoring of populations of this rare species could provide information about its environmental requirements. This information could be incorporated into management direction.
Rorippa columbiae	How does this species respond to activities which result in an alteration of the hydrology of its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by activities which alter the hydrologic regime of its supporting habitat could provide valuable information for management.
Rorippa columbiae	Is this rare species adversely affected by activities that alter the hydrologic regime supporting its habitat?	Trend monitoring of populations impacted by or potentially impacted by changes in the hydrologic regime could provide valuable information for incorporation into management direction.
Rorippa columbiae	Is this rare species adversely affected by grazing activities?	Trend, demographic, and ecophysiological monitoring in populations impacted by or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
Rorippa columbiae	Is this rare species threatened by the invasion of exotic species?	Trend monitoring of populations impacted by exotic species could provide valuable information for incorporation into management direction.
Rorippa columbiae	To what extent does riparian rehabilitation work adversely impact this species? Does the equipment used in riparian rehabilitation (bulldozers, spiders, etc.) present a potential threat?	Trend and demographic monitoring in populations impacted by or potentially impacted by riparian restoration activities, especially those involving heavy equipment, could provide valuable information for incorporation into management guidelines.
Rorippa columbiae	To what extent is this species threatened by diminished habitat caused by the invasion of exotic species?	Trend and demographic monitoring studies of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information for incorporation into management direction.
Rorippa columbiae	To what extent is this species threatened by the direct and indirect application of herbicides, especially in the roadside habitat?	Trend and demographic monitoring of populations impacted by or potentially impacted by the application of herbicides could provide valuable information for incorporation into management guidelines.
Rorippa columbiae	What are the impacts of pool fluctuation on this rare species?	Trend monitoring of the species during seasonably variable pool fluctuations should provide the baseline information which can be incorporated into management guidelines.
Rorippa columbiae	What are the predicted impacts to this species' habitat associated with development?	Trend and demographic monitoring studies of populations historically, presently, and/or potentially impacted by housing developments could provide information for incorporation into management direction.
Rorippa columbiac	What is the extent of the natural seed bank of this rare species?	Ecophysiological monitoring could provide valuable information regarding the extent of the natural seed bank of this species. This information could be incorporated into management direction.

Species name	Research Need	Potential Application
Rorippa columbiae	How does this rare species respond to alteration in the hydrologic regime of its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by alteration of hydrologic regime could provide information for incorporation into management direction.
Rorippa columbiae	How is this rare species impacted by the grazing activities of cattle and antelope?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by grazing and wildlife utilization could provide valuable information which could be incorporated into management direction.
Rorippa columbiae	What are the environmental requirements of this rare species?	Ecophysiological monitoring of this rare species could provide valuable information about its environmental requirements and limiting factors. This information could be incorporated into management direction.
Rubus bartonianus	To what extent are the known populations of this species threatened by diseases?	Ecophysiological monitoring of populations across the range of the species combined with supporting pathological lab work could provide valuable information about pathogens of this species. This information could be incorporated into management direction.
Rubus bartonianus	To what extent has this species been inventoried, particularly on the Idaho side of Hells Canyon?	Inventory for this rare species could provide valuable baseline information on population sizes and geographic distribution. This information is essential in the development of monitoring protocol and management direction.
Rubus bartonianus	What are the population sizes and their distributions of this species on the Oregon side of Hells Canyon?	Inventory of the potential habitat on the Oregon side of Hells Canyon could provide valuable information on the population sizes and geographic amplitude of this species. This information could be incorporated into management guidelines.
Rubus bartonianus	What are the population trends of this rare species?	Trend monitoring could provide valuable information for incorporation into management direction.
Rubus nigerrimus	How does this rare species respond to impacts associated with grazing?	Trend and demographic monitoring in areas impacted by or potentially impacted by grazing activities could provide valuable information which could be incorporated into management direction.
Rubus nigerrimus	Is this rare species threatened by the direct or indirect use of herbicides?	Trend and demographic monitoring in areas impacted by or potentially impacted by the direct and/or indirect application of herbicides could provide valuable information which could be incorporated into management direction.
Rubus nigerrimus	Is this rare species threatened by the invasion of exotic species?	Trend and demographic monitoring in areas impacted by or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
Rubus nigerrimus	To what extent does this rare species hybridize with sympatric <i>Rubus leucodermis</i> ? Does this hybridization threaten the genetic integrity and viability of the species?	Genetic and electrophoretic studies of this rare species in areas sympatric with <i>Rubus leucodermis</i> could enable genetic status and health to be determined. This information could be incorporated into management direction.
Rubus nigerrimus	To what extent has the historic range and habitat of this species been affected by the construction of hydroelectric dams? Do pool level fluctuations have adverse effects on this species?	Trend, demographic, and ecophysiological monitoring of populations affected by pool level fluctuation could provide valuable information about this species' response to these fluctuations. This information could be useful to management.
Senecio eritreae	How is this rare species impacted by road construction and/or maintenance activities? Do these activities open new habitat for the species?	Trend and demographic monitoring of this rare species in populations historically, presently, and/or potentially impacted by road construction and/or road maintenance could provide valuable information which could be incorporated into management.

Species name	Research Need	Potential Application
<i>Senecio erterae</i>	To what extent is this rare species threatened by the invasion of exotic species, particularly yellow star thistle?	Trend and demographic monitoring of this species in populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information for incorporation into management direction.
<i>Senecio erterae</i>	What are the environmental requirements of this rare species? Its late-season pollinators? Its seed bank?	Ecophysiological monitoring of this rare species could provide information about its environmental requirements and limiting factors. Dispersal, seed bank, pollination, could all be determined in this type of monitoring.
<i>Sidalcea oregana</i> var. <i>calva</i>	Is this a valid taxon?	Resolution of the taxonomic status of this rare variety should preclude the development of monitoring and management strategies.
<i>Sidalcea oregana</i> var. <i>calva</i>	To what extent is this species impacted by activities which alter the hydrologic regime which supports its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by activities which alter the hydrology could provide valuable information which could be incorporated into management direction.
<i>Sidalcea oregana</i> var. <i>calva</i>	To what extent is this species impacted by fire, fire suppression, and/or changes in fire regimes?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by natural and/or prescribed fire could provide valuable information which could be incorporated into management direction.
<i>Sidalcea oregana</i> var. <i>calva</i>	To what extent is this species impacted by grazing activities and by wildlife grazing?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the grazing of domestic and/or wild animals could provide valuable information which could be incorporated into management direction.
<i>Sidalcea oregana</i> var. <i>calva</i>	To what extent is this species impacted by the invasion of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Sidalcea oregana</i> var. <i>calva</i>	To what extent is this species impacted by timber harvest activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by timber harvest activities could provide information that could be incorporated into management direction.
<i>Silene seelyi</i>	What are the environmental requirements of this rare species? What are its pollinators, rate of recruitment, seed production, etc.?	Demographic and ecophysiological monitoring of this species could provide valuable information on the environmental requirements and limiting factors for this species. This baseline information could be used in the development of management strategy.
<i>Silene spaldingii</i>	Is this rare species threatened by diminished habitat attributable to agricultural conversion?	Trend monitoring of populations potentially impacted by agricultural conversion could provide important information which could be incorporated into management direction.
<i>Silene spaldingii</i>	Is this rare species threatened by fire and/or fire suppression?	Fire effects on this rare species could be determined with trend and demographic monitoring conducted in conjunction with natural or prescribed burns. This information could be incorporated into management direction.
<i>Silene spaldingii</i>	Is this rare species threatened by grazing activities?	Trend and demographic monitoring in populations threatened by grazing activities could provide valuable information which could be incorporated into management direction.

Species name	Research Need	Potential Application
Silene spaldingii	Since this species develops late in the season, what are its responses to the natural fire cycle and to prescribed burning outside the natural "window" of fire events?	Trend monitoring in populations with known fire histories and also conducted in conjunction with prescribed burning could provide information which could be incorporated into management direction.
Silene spaldingii	To what extent has the natural range of this species been diminished because of the conversion of its habitat to agricultural production?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by agricultural conversion could provide valuable information for incorporation into management direction.
Silene spaldingii	To what extent have the population sizes and geographic amplitude of this species been documented?	Inventory of potential habitat across the geographic range of this species could provide information on critical population sizes for viability and also determine the true geographic range of the species.
Silene spaldingii	To what extent is this rare species threatened by the invasion of its habitat by exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species could provide information which could be incorporated into management direction.
Silene spaldingii	To what extent is this species threatened by genetic isolation caused by habitat fragmentation?	Demographic and ecophysiological monitoring of populations could provide valuable information on the effects of habitat fragmentation on genetic isolation and the resulting vulnerability of the species.
Silene spaldingii	To what extent is this species threatened by the conversion of its natural habitat to agricultural production?	Trend monitoring of the known populations historically, presently, or potentially threatened by conversion of habitat to agricultural production could provide valuable information for incorporation into management guidelines.
Silene spaldingii	What are the effects of exotic species on this rare species and its existing and potential habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion or seeding of exotic species could provide valuable information for incorporation into management direction.
Silene spaldingii	What are the effects of herbicidal drift on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the direct and/or indirect application of herbicides could provide valuable information for incorporation into management direction.
Silene spaldingii	What are the effects of recreational activities on this rare species, particularly hiking and mountain biking?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide valuable information for incorporation into management direction.
Silene spaldingii	What are the environmental requirements of this rare species?	Trend, demographic, and ecophysiological monitoring could provide valuable information on the environmental requirements and limiting factors of this species. This information could be incorporated into management direction.
Silene spaldingii	What are the impacts of grazing on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management direction.
Silene spaldingii	What is the level of intraspecific genetic variation within this species? What variation occurs among populations over the known range of the species?	Understanding the genetic variability of this species provides information that is useful in predicting its viability and ability to adapt to changing environmental factors.
Silene spaldingii	What is the reproductive biology of this rare species, its pollinators, its dispersal agents, its reproductive success?	Trend, demographic, and ecophysiological monitoring of this rare species could provide valuable baseline information on its environmental requirements and limiting factors.

Species name	Research Need	Potential Application
<i>Silene spaldingii</i>	What are the species responses to fire? Has fire suppression historically had an adverse effect?	Determination of optimal fire regime
<i>Silene spaldingii</i>	How does this species respond to encroachment of habitat by exotic species? How does urban development affect the invasion of exotic species?	Determination of the effects of exotic species on the species of concern.
<i>Silene spaldingii</i>	How is genetic variation apportioned among populations within the montana populations and within the populations of the main part of the range of the species? Is species susceptible to inbreeding depression?	Identification of key areas for conservation focus; determination of critical population sizes for viability of species; better understanding of genetic variability across the range of the species
<i>Sisyrinchium sarmentosum</i>	To what extent is this species threatened by activities which result in an alteration of the hydrologic regime supporting its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by activities which cause an alteration in the hydrologic regime of habitat could provide valuable information for management.
<i>Sisyrinchium sarmentosum</i>	To what extent is this species threatened by grazing activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
<i>Sisyrinchium sarmentosum</i>	To what extent is this species threatened by mining activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for management.
<i>Sisyrinchium sarmentosum</i>	To what extent is this species threatened by the invasion of exotic species or the deliberate seeding of exotics?	Trend and demographic monitoring of populations historically, presently, and/or potentially threatened by the invasion of exotic species or the deliberate seeding of them could provide valuable information for incorporation into management direction.
<i>Stanleya confertiflora</i>	What are the demographic and geographic parameters of this species?	Inventory for this rare species could provide valuable information on its population sizes, locations, and geographic distribution. This information could be used in the development of monitoring and management strategy.
<i>Stephanomeria malheurensis</i>	What are the environmental requirements for this rare species? What is its natural seed bank and is the laboratory seed bank adequate to perpetuate the species?	Ecophysiological monitoring of this species could provide valuable information on its environmental requirements, particularly key elements in increasing its natural and artificial seed banks.
<i>Sullivantia hapemanii</i> var. <i>hapemanii</i>	What are the population trends of this rare species?	Trend monitoring of populations of this rare species could provide valuable information for incorporation into management direction.
<i>Tauschia hooveri</i>	What are the impacts of grazing on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide valuable information for incorporation into management guidelines.
<i>Tauschia hooveri</i>	What are the impacts of logging operations (esp. Selection of landing sites) on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by timber harvest activities could provide information for incorporation into management guidelines.
<i>Tauschia hooveri</i>	What are the impacts of military operations (particularly tank traffic) on this species? It is known to occur within the yakima firing range and its habitat is impacted by tank maneuvers.	Trend and demographic monitoring could provide valuable information on the responses of this rare species to military operations. This information could be useful in the formulation of management directions consistent with the conservation of the species.

Species name	Research Need	Potential Application
Tauschia hooveri	What are the impacts root harvest by native americans to this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by native harvest (for food purposes) activities could provide valuable information for incorporation into management guidelines.
Tauschia hooveri	What is the reproductive biology of this species? What are its pollinators? Is it dioecious or does it exhibit exaggerated protandry?	Understanding the reproductive biology of this rare species could lead to increased seed production.
Tauschia hooveri	What are the impacts of road construction on this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by road construction/maintenance could provide valuable information for incorporation into management guidelines.
Texosporium sancti-jacobi	Can this rare lichen be transplanted successfully?	Ecophysiological monitoring of this rare species of lichen could provide valuable information documenting the success rates and potential for transplanting this species. This information could be used in management strategies.
Texosporium sancti-jacobi	Has this rare lichen been inventoried adequately?	Inventory for this rare species could provide baseline information on population sizes and geographic amplitude. Collection of this information should preclude the development of monitoring and management strategies.
Thelypodium eucosmum	How is this rare species affected by fire and/or fire suppression?	Trend monitoring documenting the encroachment of juniper into the habitat of this species could provide valuable information which could be incorporated into management direction.
Thelypodium eucosmum	How is this rare species affected by grazing activities?	This species is an "ice cream" plant. Trend monitoring in population threatened by grazing activities could provide valuable information for incorporation into management guidelines.
Thelypodium eucosmum	To what extent is this rare species threatened by fire and/or fire suppression activities?	Trend monitoring in populations impacted by natural or prescribed fire could provide valuable information for incorporation into management direction.
Thelypodium eucosmum	To what extent is this rare species threatened by grazing activities?	Trend and demographic monitoring of this "ice cream" plant could provide valuable information about the impact of grazing to this species. This information could be incorporated into management guidelines.
Thelypodium eucosmum	To what extent is this rare species threatened by the invasion of exotic species?	Trend monitoring documenting the encroachment on habitat and effects of exotic species on this rare species could provide valuable information for incorporation into management direction.
Thelypodium eucosmum	What are the environmental requirements for this rare species? Its pollinators? Its natural seed bank? Its seed viability? Its reproductive biology?	Ecophysiological monitoring of this rare species could provide valuable information on its basic environmental requirements. This information could be incorporated into management direction.
Thelypodium eucosmum	What are the specific environmental requirements of this rare species?	Ecophysiological monitoring of this species could provide valuable information about its environmental requirements (e.g., soils, pollinators, seed longevity, response to fire). This information could be incorporated into management direction.
Thelypodium howellii ssp. spectabilis	Has this species been extirpated from the basin and range province?	Inventory of the historic site of this species in the basin and range province indicates that the species is no longer present. Does it occur in other sites having suitable habitat?

Species name	Research Need	Potential Application
<i>Thelypodium howellii</i> ssp. <i>spectabilis</i>	Is this rare subspecies adversely impacted by grazing activities?	Trend and demographic monitoring of this "ice cream" plant in populations historically, presently, or potentially threatened with grazing could provide valuable information which could be incorporated into management guidelines.
<i>Thelypodium howellii</i> ssp. <i>spectabilis</i>	Is this rare subspecies threatened by agricultural conversion of habitat?	Trend monitoring in populations impacted historically, presently, and potentially by agricultural conversion could provide valuable information which could be incorporated into management guidelines.
<i>Thelypodium howellii</i> ssp. <i>spectabilis</i>	Is this rare subspecies threatened by the invasion of its habitat by exotic species?	Trend monitoring could provide valuable information for incorporation into management guidelines relative to the impacts and invasion rates of exotic species.
<i>Thelypodium repandum</i>	To what extent is this rare species threatened by road construction and/or maintenance activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by road construction/maintenance could provide information for incorporation into management direction.
<i>Thelypodium repandum</i>	What are the environmental requirements of this rare species?	Ecophysiological monitoring of this rare species could provide valuable information for incorporation into management direction.
<i>Tofieldia glutinosa</i> ssp. <i>absona</i>	How does this rare subspecies respond to alteration of the hydrologic regime supporting its habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by activities that alter the hydrologic regime of its habitat could provide valuable information for incorporation into management direction.
<i>Tofieldia glutinosa</i> ssp. <i>absona</i>	What is the taxonomic "status" of this subspecies and the voucher specimens supporting its documented occurrence?	Resolution of the taxonomic "status" of this rare species should preclude the development of monitoring protocol and management direction.
<i>Trifolium douglasii</i>	Is this rare species adversely impacted by recreational activities, particularly pasturage and grazing of horses?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by recreational activities could provide information which could be incorporated into management direction.
<i>Trifolium douglasii</i>	Is this species being impacted by the invasion of exotic species?	Trend and demographic monitoring studies of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information for incorporation into management direction.
<i>Trifolium douglasii</i>	To what extent does the conversion of this species' habitat to agricultural production threaten its viability?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by conversion of habitat to agricultural production could provide valuable information which could be incorporated into management direction.
<i>Trifolium douglasii</i>	To what extent is the single documented population of this species threatened by exotic species including non-native perennial grasses included in seeding prescriptions?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the invasion of exotic species could provide valuable information which could be incorporated into management direction.
<i>Trifolium douglasii</i>	To what extent is this species impacted by conversion of its natural habitat to agricultural production?	Trend and demographic monitoring in populations (only one documented) threatened by agricultural conversion could provide valuable information which could be incorporated into management guidelines.
<i>Trifolium douglasii</i>	To what extent is this species threatened by grazing activities?	Trend and demographic monitoring of the only documented population of this species could provide valuable information for incorporation into management guidelines.
<i>Trifolium douglasii</i>	To what extent is this species threatened by recreational activities?	Trend and demographic monitoring of the only documented population of this species could provide valuable information for incorporation into management guidelines.

Species name	Research Need	Potential Application
Trifolium douglasii	To what extent is this species threatened by the invasion of its habitat by exotic species?	Trend and demographic monitoring of the only documented population of this species could provide valuable information for incorporation into management guidelines. Knapweed threatens the only population that has been documented.
Trifolium douglasii	What are the impacts and/or potential impacts of grazing activities to this rare species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by grazing activities could provide information which could be incorporated into management direction.
Trifolium owyheense	Are inventories for this rare species adequate?	Inventory for this species could provide valuable information on population sizes, locations, and geographic range of the species. This information could be useful to management.
Trifolium owyheense	Has this species been inventoried adequately?	Inventory for this rare species could document the sizes of its population and delineate its geographic amplitude. This baseline information should preclude the development of management and monitoring strategies for this species.
Trifolium owyheense	To what extent does this rare species require disturbance, particularly periodic fire?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by disturbance could provide valuable information for incorporation into management direction.
Trifolium owyheense	To what extent is this species impacted by mining activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by mining activities could provide valuable information for incorporation into management direction.
Trifolium owyheense	To what extent is this species impacted by road construction and/or maintenance activities?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by road construction/maintenance could provide information for incorporation into management direction.
Trifolium owyheense	To what extent is this species impacted by the grazing activities of cattle and big horn sheep?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by the grazing of cattle and/or big horn sheep could provide valuable information for incorporation into management direction.
Trifolium owyheense	What are the environmental requirements and limiting factors of this rare species?	Ecophysiological monitoring could provide valuable information on the environmental requirements of this rare species. This information could be incorporated into management direction.
Trifolium owyheense	What are the environmental requirements for this species?	Ecophysiological monitoring of this rare species could provide valuable information for incorporation into management direction.
Trifolium thompsonii	To what extent is this rare species threatened by fire, fire suppression, and/or changes in the fire regime?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by fire could provide valuable information for management, particularly in documenting its favorable response to this factor.
Trifolium thompsonii	To what extent is this rare species threatened by road construction and the resultant diminution of habitat?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by road construction could provide valuable information for management direction.
Trifolium thompsonii	To what extent is this rare species threatened by the invasion of exotic species and/or the deliberate seeding of exotic species?	Trend and demographic monitoring of populations historically, presently, and/or potentially impacted by exotic species and/or deliberate seeding of exotics could provide valuable information for management.
Trifolium thompsonii	What are the effects of fire and/or fire suppression on this rare species?	Trend and demographic monitoring studies of this species should provide information on responses to fire that could be incorporated into management direction.

Species name	Research Need	Potential Application
Trifolium thompsonii	What are the impacts of grazing on this rare species?	Trend and demographic monitoring studies of populations historically, presently, and/or potentially impacted by grazing activities could provide information for incorporation into management direction.

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## APPENDIX 7

### Checklist of the Vascular Plant Flora of the interior Columbia River Basin

#### CRBFLORA

*Abies amabilis*  
*Abies concolor*  
*Abies grandis*  
*Abies lasiocarpa*  
*Abies magnifica*  
*Abies procera*  
*Abronia ammophila*  
*Abronia elliptica*  
*Abronia fragrans*  
*Abronia latifolia*  
*Abronia mellifera*  
*Abronia micrantha*  
*Abronia nana*  
*Abronia turbinata*  
*Abronia umbellata*  
*Abutilon theophrasti*  
*Acaena novae-zelandica*  
*Acalypha rhomboidea*  
*Acalypha virginica*  
*Acer circinatum*  
*Acer ginnala*  
*Acer glabrum*  
*Acergrandidentatum*  
*Acer macrophyllum*  
*Acer negundo*  
*Acer palmatum*  
*Acer platanoides*  
*Acer pseudo-platanus*  
*Acer rubrum*  
*Acer saccharum*  
*Achillea millefolium*  
*Achillea nobilis*  
*Achillea ptarmica*  
*Achillea sibirica*  
*Achlys triphylla*  
*Achyraea mollis*  
*Acomastylis depressa*  
*Aconitum X bicolor*  
*Aconitum bakeri*  
*Aconitum carmichaelii*  
*Aconitum columbianum*  
*Aconitum delphinifolium*  
*Aconitum gracilentum*  
*Aconitum helleri*  
*Aconitum lutescens*  
*Aconitum napellus*  
*Aconitum septentrionale*  
*Aconitum uncinatum*  
*Aconitum variegatum*  
*Acorus calamus*  
*Actaea pachypoda*  
*Actaea rubra*

*Adenocaulon bicolor*  
*Adiantum capillus-veneris*  
*Adiantum jordanii*  
*Adiantum pedatum*  
*Adonis aestivalis*  
*Adonis annua*  
*Adoxa moschatellina*  
*Aegilops cylindrica*  
*Aeginetia spp.*  
*Aegopodium podagraria*  
*Aesculus glabra*  
*Aesculus hippocastanum*  
*Aesculus octandra*  
*Agalinis aspera*  
*Agalinis tenuifolia*  
*Agastache cusickii*  
*Agastache foeniculum*  
*Agastache occidentalis*  
*Agastache scrophulariaefolia*  
*Agastache urticifolia*  
*Ageratina adenophora*  
*Agoseris alpestris*  
*Agoseris apargioides*  
*Agoseris arizonica*  
*Agoseris aurantiaca*  
*Agoseris elata*  
*Agoseris glauca*  
*Agoseris gracilens*  
*Agoseris grandiflora*  
*Agoseris hendersonii*  
*Agoseris heterophylla*  
*Agoseris laciniata*  
*Agoseris lackschewitzii*  
*Agoseris margaritacea*  
*Agoseris retrorsa*  
*Agoseris taraxacifolia*  
*Agoseris tenuifolia*  
*Agrimonie gryposepala*  
*Agrimonie striata*  
*Agropyron amurense*  
*Agropyron caninum*  
*Agropyron cristatum*  
*Agropyron dasytachyum*  
*Agropyron desertorum*  
*Agropyron elongatum*  
*Agropyron inerme*  
*Agropyron intermedium*  
*Agropyron repens*  
*Agropyron saxicola*  
*Agropyron scribneri*  
*Agropyron sibiricum*  
*Agropyron smithii*

*Agropyron spicatum*  
*Agropyron triticeum*  
*Agrostemma githago*  
*Agrostis acquivallis*  
*Agrostis aspera*  
*Agrostis borealis*  
*Agrostis diegoensis*  
*Agrostis exarata*  
*Agrostis hallii*  
*Agrostis hiemalis*  
*Agrostis howellii*  
*Agrostis humilis*  
*Agrostis hyemalis*  
*Agrostis idahoensis*  
*Agrostis interrupta*  
*Agrostis longiligula*  
*Agrostis microphylla*  
*Agrostis oregonensis*  
*Agrostis pallens*  
*Agrostis palustris*  
*Agrostis perennans*  
*Agrostis racemosa*  
*Agrostis rossiae*  
*Agrostis scabra*  
*Agrostis semiverticillata*  
*Agrostis spica-venti*  
*Agrostis stolonifera*  
*Agrostis tenuis*  
*Agrostis thurberiana*  
*Agrostis variabilis*  
*Ailanthus altissima*  
*Aira caryophylla*  
*Aira elegans*  
*Aira obtusata*  
*Aira praecox*  
*Ajuga reptans*  
*Alchemilla occidentalis*  
*Alchemilla vulgaris*  
*Alectra ferocissimum*  
*Aletes humilis*  
*Alhagi camelorum*  
*Alhagi pseudalhagi*  
*Alisma gramineum*  
*Alisma plantago-aquatica*  
*Allenrolfea occidentalis*  
*Allium aaseae*  
*Allium acuminatum*  
*Allium amplexens*  
*Allium anceps*  
*Allium atrorubens*  
*Allium bisceptrum*  
*Allium bolanderi*  
*Allium brandegei*

*Allium brevistylum*  
*Allium campanulatum*  
*Allium canadense*  
*Allium cernuum*  
*Allium constrictum*  
*Allium crenulatum*  
*Allium cusickii*  
*Allium dictuon*  
*Allium douglasii*  
*Allium drummondii*  
*Allium falicifolium*  
*Allium fibrillum*  
*Allium geyeri*  
*Allium giganteum*  
*Allium lemmonii*  
*Allium macrum*  
*Allium madidum*  
*Allium nevadense*  
*Allium nevi*  
*Allium nigrum*  
*Allium palmeri*  
*Allium parvum*  
*Allium peninsulare*  
*Allium perdulce*  
*Allium platycaule*  
*Allium punctum*  
*Allium robinsonii*  
*Allium sanbornii*  
*Allium schoenoprasum*  
*Allium scilloides*  
*Allium serratum*  
*Allium simillimum*  
*Allium siskiyouense*  
*Allium stellatum*  
*Allium textile*  
*Allium tolmiei*  
*Allium tricoccum*  
*Allium triquetrum*  
*Allium unifolium*  
*Allium validum*  
*Allium viniale*  
*Allotropa virgata*  
*Alnus incana*  
*Alnus rhombifolia*  
*Alnus rubra*  
*Alnus sinuata*  
*Alopecurus aequalis*  
*Alopecurus alpinus*  
*Alopecurus arundinaceus*  
*Alopecurus borealis*  
*Alopecurus carolinianus*  
*Alopecurus geniculatus*  
*Alopecurus howellii*  
*Alopecurus myosuroides*

*Alopecurus pratensis*  
*Alopecurus saccatus*  
*Alsine sincoei*  
*Alternanthera pungens*  
*Alternanthera repens*  
*Alternanthera sessilis*  
*Althaea officinalis*  
*Althaea rosea*  
*Alyssum alyssoides*  
*Alyssum desertorum*  
*Alyssum maritimum*  
*Alyssum obovatum*  
*Alyssum parviflorum*  
*Amaranthus albus*  
*Amaranthus arenicola*  
*Amaranthus californicus*  
*Amaranthus caudatus*  
*Amaranthus graecizans*  
*Amaranthus hybridus*  
*Amaranthus palmeri*  
*Amaranthus powellii*  
*Amaranthus retroflexus*  
*Amaranthus rudis*  
*Amaranthus tuberculatus*  
*Ambrosia acanthicarpa*  
*Ambrosia artemisifolia*  
*Ambrosia chamissonis*  
*Ambrosia grayi*  
*Ambrosia psilostachya*  
*Ambrosia tomentosa*  
*Ambrosia trifida*  
*Amelanchier alnifolia*  
*Amelanchier cusickii*  
*Amelanchier florida*  
*Amelanchier humilis*  
*Amelanchier pallida*  
*Amelanchier utahensis*  
*Ammannia auriculata*  
*Ammannia coccinea*  
*Ammophila arenaria*  
*Amorpha canescens*  
*Amorpha fruticosa*  
*Amorpha nana*  
*Amphicarpaea bracteata*  
*Amsinckia carinata*  
*Amsinckia intermedia*  
*Amsinckia lycopoides*  
*Amsinckia menziesii*  
*Amsinckia retrorsa*  
*Amsinckia spectabilis*  
*Amsinckia tessellata*  
*Anagallis arvensis*  
*Anaphalis margaritacea*  
*Anchusa arvensis*

*Anchusa azurea*  
*Anchusa barrelieri*  
*Anchusa officinalis*  
*Andromeda polifolia*  
*Andropogon gerardii*  
*Andropogon hallii*  
*Andropogon scoparius*  
*Androsace elongata*  
*Androsace filiformis*  
*Androsace lehmanniana*  
*Androsace occidentalis*  
*Androsace septentrionalis*  
*Anelsonia eurycarpa*  
*Anemone canadensis*  
*Anemone caroliniana*  
*Anemone cylindrica*  
*Anemone deltoidea*  
*Anemone drummondii*  
*Anemone globosa*  
*Anemone ludoviciana*  
*Anemone lyallii*  
*Anemone multifida*  
*Anemone nemorosa*  
*Anemone occidentalis*  
*Anemone oregana*  
*Anemone parviflora*  
*Anemone patens*  
*Anemone piperi*  
*Anemone quinquefolia*  
*Anemone virginiana*  
*Anemopsis californica*  
*Anethum graveolens*  
*Angelica arguta*  
*Angelica canbyi*  
*Angelica dawsonii*  
*Angelica genuflexa*  
*Angelica hendersonii*  
*Angelica kingii*  
*Angelica lucida*  
*Angelica lyallii*  
*Angelica pinnata*  
*Angelica roseana*  
*Angelica tomentosa*  
*Anoda cristata*  
*Antennaria alpina*  
*Antennaria anaphaloides*  
*Antennaria arcuata*  
*Antennaria argentea*  
*Antennaria arida*  
*Antennaria aromatica*  
*Antennaria corymbosa*  
*Antennaria densifolia*  
*Antennaria dimorpha*  
*Antennaria flagellaris*

*Antennaria geyeri*  
*Antennaria howellii*  
*Antennaria lanata*  
*Antennaria luzuloides*  
*Antennaria microcephala*  
*Antennaria microphylla*  
*Antennaria monocephala*  
*Antennaria neglecta*  
*Antennaria parlinii*  
*Antennaria parvifolia*  
*Antennaria pulcherrima*  
*Antennaria racemosa*  
*Antennaria speciosa*  
*Antennaria stenophylla*  
*Antennariasuffrutescens*  
*Antennaria umbrinella*  
*Anthemis arvensis*  
*Anthemis cotula*  
*Anthemis tinctoria*  
*Anthoxanthum atistatum*  
*Anthoxanthum odoratum*  
*Anthriscus caucalis*  
*Anthriscus cerefolium*  
*Anthriscus sylvestris*  
*Anthyllis vulneraria*  
*Antirrhinum breweri*  
*Antirrhinum orontium*  
*Apargidium boreale*  
*Apera spica-venti*  
*Aphanes arvensis*  
*Apios americana*  
*Apium graveolens*  
*Aplopappus nanus*  
*Apocynum X floribundum*  
*Apocynum X medium*  
*Apocynum androsaemifolium*  
*Apocynum cannabinum*  
*Apocynum pumilum*  
*Apocynum sibiricum*  
*Apocynum tomentellum*  
*Aquilegia brevistyla*  
*Aquilegia canadensis*  
*Aquilegia coerulea*  
*Aquilegia flavescens*  
*Aquilegia formosa*  
*Aquilegia jonesii*  
*Aquilegia laramiensis*  
*Arabidopsis salsuginea*  
*Arabidopsis thaliana*  
*Arabis aculeolata*  
*Arabis alpina*  
*Arabis breweri*  
*Arabis canadensis*  
*Arabis cobrensis*

*Arabis crandallii*  
*Arabis crucisetosa*  
*Arabis cusickii*  
*Arabis davidsonii*  
*Arabis demissa*  
*Arabis dispar*  
*Arabis divaricarpa*  
*Arabis drummondii*  
*Arabis falcifurcata*  
*Arabis fecunda*  
*Arabis fendleri*  
*Arabis fernaldiana*  
*Arabis fruiticosa*  
*Arabis furcata*  
*Arabis glabra*  
*Arabis hirsuta*  
*Arabis holboellii*  
*Arabis koehleri*  
*Arabis lemmonii*  
*Arabis lignifera*  
*Arabis lyallii*  
*Arabis lyrata*  
*Arabis macdonaldiana*  
*Arabis microphylla*  
*Arabis modesta*  
*Arabis nuttallii*  
*Arabis oregana*  
*Arabis pendulocarpa*  
*Arabis perelegans*  
*Arabis platysperma*  
*Arabis puberula*  
*Arabis pusilla*  
*Arabis pycnocarpa*  
*Arabis rectissima*  
*Arabis selbyi*  
*Arabis serpentinicola*  
*Arabis shortii*  
*Arabis sparsiflora*  
*Arabis suffrutescens*  
*Arabis williamsii*  
*Aragallus besseyi*  
*Aralia californica*  
*Aralia chinensis*  
*Aralia elata*  
*Aralia nudicaulis*  
*Aralia racemosa*  
*Aralia spinosa*  
*Arbutus menziesii*  
*Arbutus unedo*  
*Arceuthobium americanum*  
*Arceuthobium campylopodum*  
*Arceuthobium douglasii*  
*Arceuthobium tsugense*  
*Arctium lappa*

*Arctium minus*  
*Arctium tomentosum*  
*Arctostaphylos X cinerea*  
*Arctostaphylos canescens*  
*Arctostaphylos cinerea*  
*Arctostaphylos columbiana*  
*Arctostaphylos glandulosa*  
*Arctostaphylos hispidula*  
*Arctostaphylos manzanita*  
*Arctostaphylos nevadensis*  
*Arctostaphylos parvifolia*  
*Arctostaphylos patula*  
*Arctostaphylos pungens*  
*Arctostaphylos stanfordina*  
*Arctostaphylos uva-ursi*  
*Arctostaphylos viscida*  
*Arenaria aculeata*  
*Arenaria burkei*  
*Arenaria californica*  
*Arenaria capillaris*  
*Arenaria congesta*  
*Arenaria douglasii*  
*Arenaria formosa*  
*Arenaria franklinii*  
*Arenaria hookeri*  
*Arenaria howellii*  
*Arenaria kingii*  
*Arenaria lateriflora*  
*Arenaria macrophylla*  
*Arenaria nuttallii*  
*Arenaria obtusiloba*  
*Arenaria paludicola*  
*Arenaria pumicola*  
*Arenaria pusilla*  
*Arenaria rossii*  
*Arenaria rubella*  
*Arenaria sajanensis*  
*Arenaria serpylliflora*  
*Arenaria stricta*  
*Arenaria uintahensis*  
*Argemone munita*  
*Argemone polyanthemus*  
*Anisaema triphyllum*  
*Aristida glauca*  
*Aristida ongiseta*  
*Aristida oligantha*  
*Aristida rightii*  
*Armoracia rusticana*  
*Arnica X gracilis*  
*Arnica alpina*  
*Arnica amplexicaulis*  
*Arnica aurantiaca*  
*Arnica betonicaefolia*  
*Arnica cernua*

*Arnica chamissonis*  
*Arnica cordifolia*  
*Arnica discoidea*  
*Arnica diversifolia*  
*Arnica foliosa*  
*Arnica fulgens*  
*Arnica gracilis*  
*Arnica latifolia*  
*Arnica lonchophylla*  
*Arnica longifolia*  
*Arnica macounii*  
*Arnica mollis*  
*Arnica nevadensis*  
*Arnica paniculata*  
*Arnica parryi*  
*Arnica parviflora*  
*Arnica rydbergii*  
*Arnica sororia*  
*Arnica spathulata*  
*Arnica tomentella*  
*Arnica viscosa*  
*Arrhenatherum elatius*  
*Artemisia abrotanum*  
*Artemisia absinthium*  
*Artemisia annua*  
*Artemisia arbuscula*  
*Artemisia biennis*  
*Artemisia campestris*  
*Artemisia cana*  
*Artemisia douglasiana*  
*Artemisia dracunculoides*  
*Artemisia filifolia*  
*Artemisia frigida*  
*Artemisia gnaphalodes*  
*Artemisia lindleyana*  
*Artemisia longifolia*  
*Artemisia longiloba*  
*Artemisia ludoviciana*  
*Artemisia michauxiana*  
*Artemisia norvegica*  
*Artemisia packardiae*  
*Artemisia papposa*  
*Artemisia pedatifida*  
*Artemisia porteri*  
*Artemisia pygmaea*  
*Artemisia rigida*  
*Artemisia rothrockii*  
*Artemisia scopulorum*  
*Artemisia spinescens*  
*Artemisia suksdorfii*  
*Artemisia tilesii*  
*Artemisia tridentata*  
*Artemisia trifurcata*  
*Artemisia tripartita*

*Artemisia vulgaris*  
*Arum italicum*  
*Aruncus dioicus*  
*Aruncus vulgaris*  
*Asarum canadense*  
*Asarum caudatum*  
*Asarum hartwegii*  
*Asarum lemmonii*  
*Asarum marmoratum*  
*Asarum wagneri*  
*Asclepias asperula*  
*Asclepias cordifolia*  
*Asclepias cryptoceras*  
*Asclepias fascicularis*  
*Asclepias labriformis*  
*Asclepias lanuginosa*  
*Asclepias ovalifolia*  
*Asclepias pumila*  
*Asclepias solanacea*  
*Asclepias speciosa*  
*Asclepias stenophylla*  
*Asclepias subverticillata*  
*Asclepias sullivantii*  
*Asclepias syriaca*  
*Asclepias tuberosa*  
*Asclepias verticillata*  
*Asclepias viridiflora*  
*Asparagus officinalis*  
*Asperugo procumbens*  
*Asperula odorata*  
*Aspidotis densa*  
*Asplenium septentrionale*  
*Asplenium trichomanes*  
*Asplenium trichomanes-ramosum*  
*Aster X amethystinus*  
*Aster X bracteolatus*  
*Aster X sagittifolius*  
*Aster adscendens*  
*Aster alpinus*  
*Aster amethystinus*  
*Aster brachyactis*  
*Aster brickelliioides*  
*Aster campestris*  
*Aster chilensis*  
*Aster ciliolatus*  
*Aster conspicuus*  
*Aster curtus*  
*Aster eatonii*  
*Aster elatus*  
*Aster engelmannii*  
*Aster ericoides*

*Aster falcatus*  
*Aster foliaceus*  
*Aster fremontii*  
*Aster frondosus*  
*Aster glaucescens*  
*Aster glaucodes*  
*Aster gormanii*  
*Aster hesperius*  
*Aster integrifolius*  
*Aster jessicae*  
*Aster junciformis*  
*Aster laevisculmis*  
*Aster laevis*  
*Aster lateriflorus*  
*Aster ledophyllus*  
*Aster lucidulus*  
*Aster modestus*  
*Aster mollis*  
*Aster novae-angliae*  
*Aster oblongifolius*  
*Aster occidentalis*  
*Aster ontariensis*  
*Aster oolentangiensis*  
*Aster oregonensis*  
*Aster paludicola*  
*Aster pansus*  
*Aster paucicapitatus*  
*Aster pauciflorus*  
*Aster perelegans*  
*Aster pilosus*  
*Aster pubentior*  
*Aster puniceus*  
*Aster radulinus*  
*Aster sagittifolius*  
*Aster scopulorum*  
*Aster sericeus*  
*Aster shastensis*  
*Aster sibiricus*  
*Aster sibiricus*  
*Aster simplex*  
*Aster siskiyouensis*  
*Aster stenomerus*  
*Aster subspicatus*  
*Aster tephrodes*  
*Aster vialis*  
*Astilbe simplicifolia*  
*Astragalus aboriginum*  
*Astragalus accedens*  
*Astragalus adanensis*  
*Astragalus adsurgens*  
*Astragalus agnicidius*  
*Astragalus agrestis*  
*Astragalus alpinus*  
*Astragalus alvordensis*

*Astragalus amblytropis*  
*Astragalus americanus*  
*Astragalus amnis-amissi*  
*Astragalus anserinus*  
*Astragalus applegatei*  
*Astragalus aquilonius*  
*Astragalus aretioides*  
*Astragalus argophyllus*  
*Astragalus arrectus*  
*Astragalus arthuri*  
*Astragalus atratus*  
*Astragalus atropubescens*  
*Astragalus australis*  
*Astragalus barrii*  
*Astragalus beckwithii*  
*Astragalus bisulcatus*  
*Astragalus bourgovii*  
*Astragalus californicus*  
*Astragalus calycosus*  
*Astragalus camptopus*  
*Astragalus canadensis*  
*Astragalus caricinus*  
*Astragalus ceramicus*  
*Astragalus chamaeleuce*  
*Astragalus chinensis*  
*Astragalus cibarius*  
*Astragalus cicer*  
*Astragalus collinus*  
*Astragalus columbianus*  
*Astragalus conjunctus*  
*Astragalus cottonii*  
*Astragalus crassicaupus*  
*Astragalus curvicaupus*  
*Astragalus cusickii*  
*Astragalus dasyglottis*  
*Astragalus diaphanus*  
*Astragalus diurnus*  
*Astragalus diversifolius*  
*Astragalus drabelliformis*  
*Astragalus drummondii*  
*Astragalus eremiticus*  
*Astragalus eucosmus*  
*Astragalus falcatus*  
*Astragalus filipes*  
*Astragalus flexuosus*  
*Astragalus gambelianus*  
*Astragalus geyeri*  
*Astragalus gilviflorus*  
*Astragalus glareosus*  
*Astragalus gracilis*  
*Astragalus grayi*  
*Astragalus hoodianus*  
*Astragalus howellii*  
*Astragalus hyalinus*

*Astragalus impensus*  
*Astragalus inflexus*  
*Astragalus inversus*  
*Astragalus iodanthus*  
*Astragalus jejunus*  
*Astragalus kentrophyta*  
*Astragalus leibergii*  
*Astragalus lemmonii*  
*Astragalus lentiginosus*  
*Astragalus leptaleus*  
*Astragalus lotiflorus*  
*Astragalus lyallii*  
*Astragalus macounii*  
*Astragalus malacus*  
*Astragalus microcystis*  
*Astragalus misellus*  
*Astragalus miser*  
*Astragalus missouriensis*  
*Astragalus molybdenus*  
*Astragalus mortoni*  
*Astragalus mulfordiae*  
*Astragalus neglectus*  
*Astragalus newberryi*  
*Astragalus nudisiliques*  
*Astragalus obscurus*  
*Astragalus oniciformis*  
*Astragalus oophorus*  
*Astragalus oregonus*  
*Astragalus palouensis*  
*Astragalus paysonii*  
*Astragalus peckii*  
*Astragalus pectinatus*  
*Astragalus plattensis*  
*Astragalus platytropis*  
*Astragalus promianthus*  
*Astragalus pubentissimus*  
*Astragalus pulsiferae*  
*Astragalus purshii*  
*Astragalus racemosus*  
*Astragalus revertiformis*  
*Astragalus revertus*  
*Astragalus riparius*  
*Astragalus robbinsii*  
*Astragalus salinus*  
*Astragalus salmonis*  
*Astragalus scaphoides*  
*Astragalus sclerocarpus*  
*Astragalus sheldonii*  
*Astragalus shultiziorum*  
*Astragalus sinuatus*  
*Astragalus sonneanus*  
*Astragalus spaldingii*  
*Astragalus spatulatus*  
*Astragalus speirocarpus*

*Astragalus stenophyllus*  
*Astragalus succumbens*  
*Astragalus tegetarioides*  
*Astragalus tenellus*  
*Astragalus terminalis*  
*Astragalus tetrapterus*  
*Astragalus toanus*  
*Astragalus tweedyi*  
*Astragalus tyghensis*  
*Astragalus umbraticus*  
*Astragalus utahensis*  
*Astragalus vallis*  
*Astragalus vexilliflexus*  
*Astragalus watsonianus*  
*Astragalus whitneyi*  
*Athyrium cyclosorum*  
*Athyrium distentifolium*  
*Athyrium filix-femina*  
*Athysanus pusillus*  
*Atriplex argentea*  
*Atriplex californica*  
*Atriplex canescens*  
*Atriplex confertifolia*  
*Atriplex dioica*  
*Atriplex halimus*  
*Atriplex heterosperma*  
*Atriplex hortensis*  
*Atriplex hymenelytra*  
*Atriplex lentiformis*  
*Atriplex nummularia*  
*Atriplex nuttallii*  
*Atriplex oblongifolia*  
*Atriplex patula*  
*Atriplex phyllostegia*  
*Atriplex powellii*  
*Atriplex pusilla*  
*Atriplex rosea*  
*Atriplex truncata*  
*Atropa belladonna*  
*Aucuba japonica*  
*Avena barbata*  
*Avena dubia*  
*Avena fatua*  
*Avena sativa*  
*Axyris amaranthoides*  
*Azolla caroliniana*  
*Azolla filiculoides*  
*Azolla mexicana*  
*Azolla pinnata*  
*Baccharis douglasii*  
*Baccharis pilularis*  
*Bacopa rotundifolia*  
*Baeria maritima*  
*Baeria minor*

Balsamorhiza X tomentosa  
 Balsamorhiza careyana  
 Balsamorhiza deltoidea  
 Balsamorhiza hirsuta  
 Balsamorhiza hookeri  
 Balsamorhiza incana  
 Balsamorhiza macrophylla  
 Balsamorhiza rosea  
 Balsamorhiza sagittata  
 Balsamorhiza sericea  
 Balsamorhiza serrata  
 Balsamorhiza terebinthacea  
 Barbarea americana  
 Barbarea orthoceras  
 Barbarea verna  
 Barbarea vulgaris  
 Bassia hirsuta  
 Bassia hyssopifolia  
 Beckmannia syzigachne  
 Belamcanda chinensis  
 Bellis perennis  
 Bensoniella oregona  
 Berberis aquifolium  
 Berberis piperiana  
 Berberis pumila  
 Berberis repens  
 Berberis thunbergii  
 Berberis vulgaris  
 Bergia texana  
 Berteroa incana  
 Berula erecta  
 Besseyia rubra  
 Besseyia wyomingensis  
 Beta vulgaris  
 Betula X piperi  
 Betula X sandbergii  
 Betula X sargentii  
 Betula X utahensis  
 Betula glandulosa  
 Betula hallii  
 Betula lenta  
 Betula occidentalis  
 Betula papyrifera  
 Betula pendula  
 Betula pumila  
 Bidens beckii  
 Bidens cernua  
 Bidens frondosa  
 Bidens pilosa  
 Bidens tenuisecta  
 Bidens tripartita  
 Bidens vulgata  
 Blechnum spicant  
 Blepharidachne kingii

Blepharipappus scaber  
 Blyxa aubertii  
 Boissduvalia densiflora  
 Boissduvalia glabella  
 Boissduvalia macrantha  
 Boissduvalia sparsiflora  
 Boissduvalia stricta  
 Bolandra oregana  
 Boltonia asteroides  
 Borago officinalis  
 Borreria alata  
 Boschniakia hookeri  
 Boschniakia strobilacea  
 Botrychium ascendens  
 Botrychium boreale  
 Botrychium campestre  
 Botrychium crenulatum  
 Botrychium hesperium  
 Botrychium lanceolatum  
 Botrychium lunaria  
 Botrychium matricariifolium  
 Botrychium minganense  
 Botrychium montanum  
 Botrychium multifidum  
 Botrychium paradoxum  
 Botrychium pedunculosum  
 Botrychium pumicola  
 Botrychium silaifolium  
 Botrychium simplex  
 Bouteloua barbata  
 Bouteloua curtipendula  
 Bouteloua gracilis  
 Bouteloua hirsuta  
 Boykinia elata  
 Boykinia intermedia  
 Boykinia major  
 Brachypodium distachyon  
 Brasenia schreberi  
 Brassica alba  
 Brassica campestris  
 Brassica hirta  
 Brassica juncea  
 Brassica kaber  
 Brassica napus  
 Brassica nigra  
 Brassica oleraceae  
 Braya humilis  
 Brickellia californica  
 Brickellia grandiflora  
 Brickellia greenei  
 Brickellia microphylla  
 Brickellia oblongifolia  
 Briza maxima  
 Briza minor

Brodiaea californica  
 Brodiaea capitata  
 Brodiaea congesta  
 Brodiaea coronaria  
 Brodiaea crocea  
 Brodiaea dissimulata  
 Brodiaea douglasii  
 Brodiaea elegans  
 Brodiaea gracilis  
 Brodiaea hendersonii  
 Brodiaea howellii  
 Brodiaea hyacinthina  
 Brodiaea ida-maia  
 Brodiaea laxa  
 Brodiaea multiflora  
 Brodiaea pulchella  
 Brodiaea terrestris  
 Bromus anomalus  
 Bromus arenarius  
 Bromus arvensis  
 Bromus brevifloratus  
 Bromus brizaeformis  
 Bromus carinatus  
 Bromus catharticus  
 Bromus ciliatus  
 Bromus commutatus  
 Bromus diandrus  
 Bromus erectus  
 Bromus inermis  
 Bromus japonicus  
 Bromus kalmii  
 Bromus laevipes  
 Bromus latiglumis  
 Bromus macrostachys  
 Bromus madritensis  
 Bromus maritimus  
 Bromus mollis  
 Bromus orcutianus  
 Bromus pacificus  
 Bromus porteri  
 Bromus pubescens  
 Bromus racemosus  
 Bromus rigidus  
 Bromus rubens  
 Bromus secalinus  
 Bromus sitchensis  
 Bromus squarrosus  
 Bromus sterilis  
 Bromus suksdorfii  
 Bromus tectorum  
 Bromus tomentellus  
 Bromus trinii  
 Bromus vulgaris  
 Bryonia alba

Bryonia dioica  
 Buchloe dactyloides  
 Buddleia davidii  
 Bulbostylis annua  
 Bulbostylis capillaris  
 Bupleurum americanum  
 Butomus umbellatus  
 Cacalia plantaginea  
 Cacaliopsis nardosmia  
 Cakile edentula  
 Cakile maritima  
 Calamagrostis breweri  
 Calamagrostis californica  
 Calamagrostis canadensis  
 Calamagrostis crassiglumis  
 Calamagrostis howellii  
 Calamagrostis koelerioides  
 Calamagrostis montanensis  
 Calamagrostis purpurascens  
 Calamagrostis rubescens  
 Calamagrostis scopulorum  
 Calamagrostis sesquiflora  
 Calamagrostis stricta  
 Calamagrostis tweedyi  
 Calamovilfa longifolia  
 Calandrinia caulescens  
 Calandrinia ciliata  
 Calla palustris  
 Callirhoe involucrata  
 Callitriche anceps  
 Callitriche fassettii  
 Callitriche hermaphrodita  
 Callitriche heterophylla  
 Callitriche marginata  
 Callitriche stagnalis  
 Callitriche trochlearis  
 Callitriche verna  
 Calocedrus decurrens  
 Calochortus amabilis  
 Calochortus apiculatus  
 Calochortus bruneauensis  
 Calochortus elegans  
 Calochortus eurycarpus  
 Calochortus greenei  
 Calochortus gunnisonii  
 Calochortus howellii  
 Calochortus indecorus  
 Calochortus longebarbatus  
 Calochortus lyallii  
 Calochortus macrocarpus  
 Calochortus maweanus  
 Calochortus nitidus  
 Calochortus nuttallii  
 Calochortus subalpinus

Calochortus tolmiei  
 Calochortus umpquaensis  
 Calochortus uniflorus  
 Calochortus vestae  
 Caltha asarifolia  
 Caltha biflora  
 Caltha howellii  
 Caltha leptosepala  
 Caltha palustris  
 Calycadenia ciliosa  
 Calycadenia truncata  
 Calycanthus floridus  
 Calylophus lavandulifolius  
 Calylophus serrulatus  
 Calypso bulbosa  
 Calyptidium roseum  
 Calystegia macounii  
 Calystegia sepium  
 Camassia cusickii  
 Camassia howellii  
 Camassia leichtlinii  
 Camassia ovata  
 Camassia quamash  
 Camassia suksdorfii  
 Camelina microcarpa  
 Camelina sativa  
 Camissonia claviformis  
 Camissonia graciliflora  
 Camissonia palmeri  
 Camissonia parvula  
 Camissonia pterosperma  
 Camissonia pygmaea  
 Campanula aparinoides  
 Campanula elatines  
 Campanula glomerata  
 Campanula lasiocarpa  
 Campanula medium  
 Campanula parryi  
 Campanula persicifolia  
 Campanula piperi  
 Campanula prenanthoides  
 Campanula rapunculoides  
 Campanula rotundifolia  
 Campanula scabrella  
 Campanula scouleri  
 Campanula uniflora  
 Campsis radicans  
 Canbya aurea  
 Cannabis sativa  
 Capsella bursa-pastoris  
 Capsicum frutescens  
 Caragana arborescens  
 Caragana pygmaea  
 Cardamine bellidifolia

Cardamine breweri  
 Cardamine bulbosa  
 Cardamine californica  
 Cardamine concatenata  
 Cardamine constancei  
 Cardamine cordifolia  
 Cardamine gemmata  
 Cardamine hirsuta  
 Cardamine lyallii  
 Cardamine oligosperma  
 Cardamine pattersonii  
 Cardamine pensylvanica  
 Cardamine pulcherrima  
 Cardamine rupicola  
 Cardaria chalapensis  
 Cardaria draba  
 Cardaria pubescens  
 Cardaria spp.  
 Cardionema ramosissima  
 Carduus acanthoides  
 Carduus crispus  
 Carduus nutans  
 Carduus pycnocephalus  
 Carduus tenuifloras  
 Carduus tenuiflorus  
 Carex ablata  
 Carex aboriginum  
 Carex abrupta  
 Carex adusta  
 Carex aenea  
 Carex aggregata  
 Carex albonigra  
 Carex alopecoidea  
 Carex amplifolia  
 Carex angustata  
 Carex anthoxanthea  
 Carex aperta  
 Carex aquatilis  
 Carex arapahoensis  
 Carex arcta  
 Carex assinioboinensis  
 Carex atherodes  
 Carex athrostachya  
 Carex atrata  
 Carex aurea  
 Carex backii  
 Carex barbarae  
 Carex bebbii  
 Carex bella  
 Carex bicknellii  
 Carex bigelowii  
 Carex bipartita  
 Carex blanda  
 Carex brainerdii

*Carex brevicaulis*  
*Carex brevior*  
*Carex breweri*  
*Carex brunnescens*  
*Carex buxbaumii*  
*Carex californica*  
*Carex campylocarpa*  
*Carex canescens*  
*Carex capillaris*  
*Carex capitata*  
*Carex chordorrhiza*  
*Carex circinata*  
*Carex comosa*  
*Carex concinna*  
*Carex concinnoides*  
*Carex convoluta*  
*Carex crawei*  
*Carex crawfordii*  
*Carex cristatella*  
*Carex cusickii*  
*Carex densa*  
*Carex deweyana*  
*Carex diandra*  
*Carex dioica*  
*Carex disperma*  
*Carex douglasii*  
*Carex drummondiana*  
*Carex ebenea*  
*Carex eburnea*  
*Carex echinata*  
*Carex elynoides*  
*Carex emoryi*  
*Carex epapillosa*  
*Carex eurycarpa*  
*Carex festucaecea*  
*Carex feta*  
*Carex filifolia*  
*Carex flava*  
*Carex foenea*  
*Carex foetida*  
*Carex formosa*  
*Carex fracta*  
*Carex geyeri*  
*Carex gigas*  
*Carex gracillima*  
*Carex granularis*  
*Carex gravida*  
*Carex gymnoclada*  
*Carex gynodynama*  
*Carex halliana*  
*Carex hassei*  
*Carex haydeniana*  
*Carex haydenii*  
*Carex hendersonii*

*Carex hoodii*  
*Carex hookerana*  
*Carex hystrixina*  
*Carex illota*  
*Carex integra*  
*Carex interior*  
*Carex interrupta*  
*Carex intumescens*  
*Carex jonesii*  
*Carex lacustris*  
*Carex laeviconica*  
*Carex laeviculmis*  
*Carex lanuginosa*  
*Carex lasiocarpa*  
*Carex lenticularis*  
*Carex leporina*  
*Carex leporinella*  
*Carex leptalea*  
*Carex limnophila*  
*Carex limosa*  
*Carex livida*  
*Carex luzulina*  
*Carex lyngbyei*  
*Carex macrocephala*  
*Carex macrochaeta*  
*Carex maritima*  
*Carex meadii*  
*Carex mendocinensis*  
*Carex mertensii*  
*Carex microglochin*  
*Carex microptera*  
*Carex misandra*  
*Carex molesta*  
*Carex multicaulis*  
*Carex multicostata*  
*Carex nardina*  
*Carex nebraskensis*  
*Carex nervina*  
*Carex neurophora*  
*Carex nigricans*  
*Carex normalis*  
*Carex norvegica*  
*Carex nova*  
*Carex nubicola*  
*Carex nudata*  
*Carex obnupta*  
*Carex obovoidea*  
*Carex obtusata*  
*Carex occidentalis*  
*Carex oederi*  
*Carex oregonensis*  
*Carex ormantha*  
*Carex pachycarpa*  
*Carex pachystachya*

*Carex pansa*  
*Carex parryana*  
*Carex paucicostata*  
*Carex pauciflora*  
*Carex paupercula*  
*Carex paysonis*  
*Carex peckii*  
*Carex pedunculata*  
*Carex pensylvanica*  
*Carex petasata*  
*Carex petricosa*  
*Carex phaeocephala*  
*Carex phyllomanica*  
*Carex pluriflora*  
*Carex podocarpa*  
*Carex praeceptorum*  
*Carex praegracilis*  
*Carex prairea*  
*Carex praticola*  
*Carex prionophylla*  
*Carex proposita*  
*Carex pseudo-cyperus*  
*Carex pyrenaica*  
*Carex raynoldsii*  
*Carex retrorsa*  
*Carex richardsonii*  
*Carex rosea*  
*Carex rossii*  
*Carex rupestris*  
*Carex sartwellii*  
*Carex saxatilis*  
*Carex saximontana*  
*Carex scabriuscula*  
*Carex scirpoidea*  
*Carex scoparia*  
*Carex scopulorum*  
*Carex senta*  
*Carex serratodens*  
*Carex sheldonii*  
*Carex simulata*  
*Carex sitchensis*  
*Carex spectabilis*  
*Carex sprengelii*  
*Carex stenophylla*  
*Carex stenoptila*  
*Carex sterilis*  
*Carex stipata*  
*Carex stramineiformis*  
*Carex stricta*  
*Carex stylosa*  
*Carex subfusca*  
*Carex subnigricans*  
*Carex substricta*  
*Carex sychnocephala*

*Carex tenera*  
*Carex teneraeformis*  
*Carex tenuiflora*  
*Carex tetanica*  
*Carex tinctoria*  
*Carex tolmiei*  
*Carex torreyi*  
*Carex tracyi*  
*Carex tribuloides*  
*Carex tumulicola*  
*Carex umbellata*  
*Carex unilateralis*  
*Carex utriculata*  
*Carex vaginata*  
*Carex vallicola*  
*Carex vesicaria*  
*Carex viridior*  
*Carex vulpinoidea*  
*Carex xerantica*  
*Carpinus betulus*  
*Carthamus baeticus*  
*Carthamus lanatus*  
*Carthamus leucocaulus*  
*Carthamus oxyacantha*  
*Carthamus tinctorius*  
*Carum carvi*  
*Carya laciniosa*  
*Carya ovata*  
*Cassiope lycopodioides*  
*Cassiope mertensiana*  
*Cassiope stelleriana*  
*Cassiope tetragona*  
*Castanea dentata*  
*Castanopsis chrysophylla*  
*Castanopsis sempervirens*  
*Castilleja affinis*  
*Castilleja angustifolia*  
*Castilleja applegatei*  
*Castilleja arachnoides*  
*Castilleja brevifolia*  
*Castilleja cervina*  
*Castilleja chlorotica*  
*Castilleja christii*  
*Castilleja chromosa*  
*Castilleja chrysantha*  
*Castilleja covilleana*  
*Castilleja crispula*  
*Castilleja crista-galli*  
*Castilleja cryptantha*  
*Castilleja cusickii*  
*Castilleja elata*  
*Castilleja elmeri*  
*Castilleja exilis*  
*Castilleja flava*

*Castilleja fraterna*  
*Castilleja glandulifera*  
*Castilleja gracillima*  
*Castilleja hispida*  
*Castilleja inverta*  
*Castilleja lapidicola*  
*Castilleja lauta*  
*Castilleja lemmonii*  
*Castilleja levisecta*  
*Castilleja linariaefolia*  
*Castilleja longispica*  
*Castilleja lutea*  
*Castilleja lutescens*  
*Castilleja miniata*  
*Castilleja nivea*  
*Castilleja occidentalis*  
*Castilleja oreopola*  
*Castilleja oresbia*  
*Castilleja ownbeyana*  
*Castilleja pallens*  
*Castilleja parviflora*  
*Castilleja peckiana*  
*Castilleja pilosa*  
*Castilleja pinetorum*  
*Castilleja pruinosa*  
*Castilleja psittacina*  
*Castilleja pulchella*  
*Castilleja rhexifolia*  
*Castilleja rubida*  
*Castilleja rupicola*  
*Castilleja rustica*  
*Castilleja schizotricha*  
*Castilleja sessiliflora*  
*Castilleja suksdorfii*  
*Castilleja sulphurea*  
*Castilleja thompsonii*  
*Castilleja viscidula*  
*Castilleja wightii*  
*Castilleja xanthotricha*  
*Catabrosa aquatica*  
*Catalpa speciosa*  
*Caulalis microcarpa*  
*Caulanthus crassicaulis*  
*Caulanthus pilosus*  
*Caulophyllum thalictroides*  
*Ceanothus cordulatus*  
*Ceanothus cuneatus*  
*Ceanothus fendleri*  
*Ceanothus herbaceus*  
*Ceanothus integerrimus*  
*Ceanothus prostratus*  
*Ceanothus pumilus*  
*Ceanothus sanguineus*  
*Ceanothus thyrsiflorus*

*Ceanothus velutinus*  
*Celastrus orbiculata*  
*Celastrus scandens*  
*Celtis douglasii*  
*Celtis occidentalis*  
*Celtis reticulata*  
*Cenchrus carolinianus*  
*Cenchrus longispinus*  
*Centaurea calcitrapa*  
*Centaurea cyanus*  
*Centaurea dealbata*  
*Centaurea diffusa*  
*Centaurea dubia*  
*Centaurea iberica*  
*Centaurea jacea*  
*Centaurea juncea*  
*Centaurea juncea x nigra*  
*Centaurea macrocephala*  
*Centaurea maculosa*  
*Centaurea melitensis*  
*Centaurea montana*  
*Centaurea nigra*  
*Centaurea nigrescens*  
*Centaurea pratensis*  
*Centaurea repens*  
*Centaurea scabiosa*  
*Centaurea solstitialis*  
*Centaurea trichocephala*  
*Centaurea virgata*  
*Centaureum exaltatum*  
*Centaureum muhlenbergii*  
*Centaureum namophilum*  
*Centaureum umbellatum*  
*Centranthus ruber*  
*Centunculus minimus*  
*Cephalanthera austriaca*  
*Cerastium arvense*  
*Cerastium beringianum*  
*Cerastium dubium*  
*Cerastium nutans*  
*Cerastium semidecandrum*  
*Cerastium siculum*  
*Cerastium strictum*  
*Cerastium tomentosum*  
*Cerastium viscosum*  
*Cerastium vulgatum*  
*Ceratoides lanata*  
*Ceratophyllum demersum*  
*Cercis canadensis*  
*Cercocarpus betuloides*  
*Cercocarpus ledifolius*  
*Cercocarpus montanus*  
*Chaenactis alpina*  
*Chaenactis cusickii*

*Chaenactis douglasii*  
*Chaenactis evermannii*  
*Chaenactis macrantha*  
*Chaenactis nevi*  
*Chaenactis ramosa*  
*Chaenactis stevioides*  
*Chaenactis thompsonii*  
*Chaenomeles japonica*  
*Chaenorhinum minus*  
*Chaetadelfia wheeleri*  
*Chamaebatiaria millifolium*  
*Chamaechaenactis scaposa*  
*Chamaecyparis lawsoniana*  
*Chamaecyparis nootkatensis*  
*Chamaecyparis pisifera*  
*Chamaerhodos erecta*  
*Chamaesaracha nana*  
*Chamaesyce ocellata*  
*Cheilanthes densa*  
*Cheilanthes feci*  
*Cheilanthes gracillima*  
*Cheilanthes intertexta*  
*Cheilanthes lanosa*  
*Chelidonium majus*  
*Chenopodium album*  
*Chenopodium ambrosioides*  
*Chenopodium botrys*  
*Chenopodium bushianum*  
*Chenopodium capitatum*  
*Chenopodium chenopodioides*  
*Chenopodium foliosum*  
*Chenopodium fremontii*  
*Chenopodium gigantospermum*  
*Chenopodium glaucum*  
*Chenopodium leptophyllum*  
*Chenopodium murale*  
*Chenopodium overi*  
*Chenopodium pratericola*  
*Chenopodium pumilio*  
*Chenopodium rubrum*  
*Chenopodium standleyanum*  
*Chenopodium strictum*  
*Chenopodium watsonii*  
*Chimaphila menziesii*  
*Chimaphila umbellata*  
*Chionophila tweedyi*  
*Chloris verticillata*  
*Chloris virgata*  
*Chlorocrambe hastata*  
*Chlorogalum angustifolium*  
*Chlorogalum pomeridianum*  
*Chondrilla juncea*  
*Chorispora tenella*  
*Chorizanthe brevicornu*

*Chorizanthe watsonii*  
*Chrysanthemum balsamita*  
*Chrysanthemum leucanthemum*  
*Chrysanthemum maximum*  
*Chrysanthemum parthenium*  
*Chrysanthemum segetum*  
*Chrysopsis chrysophylla*  
*Chrysopsis sempervirens*  
*Chrysopsis chrysophylla*  
*Chrysopogon aciculatus*  
*Chrysopsis horrida*  
*Chrysopsis oregona*  
*Chrysopsis stenophylla*  
*Chrysopsis villosa*  
*Chrysosplenium*  
*glechomaefolium*  
*Chrysosplenium tetrandrum*  
*Chrysothamnus albidus*  
*Chrysothamnus Greenei*  
*Chrysothamnus humilis*  
*Chrysothamnus linifolius*  
*Chrysothamnus nauseosus*  
*Chrysothamnus parryi*  
*Chrysothamnus viscidiflorus*  
*Cicer arietinum*  
*Cichorium endivia*  
*Cichorium intybus*  
*Cicuta bulbifera*  
*Cicuta douglasii*  
*Cicuta maculata*  
*Cicuta vagans*  
*Cimicifuga elata*  
*Cimicifuga laciniata*  
*Cinna arundinacea*  
*Cinna latifolia*  
*Circaea alpina*  
*Circaea lutetiana*  
*Circaea pacifica*  
*Cirsium acanthodotum*  
*Cirsium acaulescens*  
*Cirsium altissimum*  
*Cirsium americanum*  
*Cirsium andersonii*  
*Cirsium arvense*  
*Cirsium brevifolium*  
*Cirsium brevistylum*  
*Cirsium breweri*  
*Cirsium callilepis*  
*Cirsium canescens*  
*Cirsium canovirens*  
*Cirsium centaureae*  
*Cirsium ciliolatum*  
*Cirsium coulteri*  
*Cirsium davisii*

*Cirsium drummondii*  
*Cirsium edule*  
*Cirsium flodmanii*  
*Cirsium foliosum*  
*Cirsium hallii*  
*Cirsium hookerianum*  
*Cirsium lanceolatum*  
*Cirsium longistylum*  
*Cirsium magnificum*  
*Cirsium muticum*  
*Cirsium neomexicanum*  
*Cirsium ochrocentrum*  
*Cirsium pastoris*  
*Cirsium polyphyllum*  
*Cirsium pulcherrimum*  
*Cirsium remotifolium*  
*Cirsium scariosum*  
*Cirsium subniveum*  
*Cirsium tweedyi*  
*Cirsium undulatum*  
*Cirsium utahense*  
*Cirsium vulgare*  
*Cistus X hybridus*  
*Cistus salvifolius*  
*Cladanthamnus pyrolaeiflorus*  
*Cladanthamnus pyroliflorus*  
*Clarkia amoena*  
*Clarkia gracilis*  
*Clarkia pulchella*  
*Clarkia purpurea*  
*Clarkia quadrivulnera*  
*Clarkia rhomboidea*  
*Clarkia viminea*  
*Claytonia asarifolia*  
*Claytonia bellidifolia*  
*Claytonia chamissoi*  
*Claytonia chrysantha*  
*Claytonia dichotoma*  
*Claytonia lanceolata*  
*Claytonia megarrhiza*  
*Claytonia megarrhiza*  
*Claytonia nivalis*  
*Claytonia parvifolia*  
*Clematis hirsutissima*  
*Clematis ligusticifolia*  
*Clematis occidentalis*  
*Clematis orientalis*  
*Clematis virginiana*  
*Clematis vitalba*  
*Cleome lutea*  
*Cleome multicaulis*  
*Cleome platycarpa*  
*Cleome serrulata*  
*Cleomella macbrideana*

*Cleomella oocarpa*  
*Cleomella parviflora*  
*Cleomella plocasperma*  
*Clerodendrum thompsoniae*  
*Clerodendrum trichotomum*  
*Clintonia andrewsiana*  
*Clintonia uniflora*  
*Cnicus benedictus*  
*Cocconia grandis*  
*Cochleria officinalis*  
*Coldenia nuttallii*  
*Coleanthus subtilis*  
*Collinsia floribunda*  
*Collinsia grandiflora*  
*Collinsia greenei*  
*Collinsia linearis*  
*Collinsia parviflora*  
*Collinsia pusilla*  
*Collinsia rattanii*  
*Collinsia sparsiflora*  
*Collinsia tenella*  
*Collinsia torreyi*  
*Collomia aristella*  
*Collomia debilis*  
*Collomia grandiflora*  
*Collomia heterophylla*  
*Collomia linearis*  
*Collomia macrocalyx*  
*Collomia mazama*  
*Collomia tenella*  
*Collomia tinctoria*  
*Comandra californica*  
*Comandra umbellata*  
*Commelina communis*  
*Conimitella williamsii*  
*Conioselinum chinense*  
*Conioselinum pacificum*  
*Conioselinum scopulorum*  
*Conium maculatum*  
*Conringia orientalis*  
*Convallaria majalis*  
*Convolvulus arvensis*  
*Convolvulus californicus*  
*Convolvulus calystegia*  
*Convolvulus japonicus*  
*Convolvulus nyctagineus*  
*Convolvulus polymorphus*  
*Convolvulus subacaulis*  
*Conyza bonariensis*  
*Conyza canadensis*  
*Conyza ramosissima*  
*Coptis asplenifolia*  
*Coptis laciniata*  
*Coptis occidentalis*

*Corallorhiza maculata*  
*Corallorhiza mertensiana*  
*Corallorhiza odontorhiza*  
*Corallorhiza striata*  
*Corallorhiza trifida*  
*Corallorhiza wisteriana*  
*Cordylalis aquae-gelidae*  
*Cordylanthus capitatus*  
*Cordylanthus parviflorus*  
*Cordylanthus ramosus*  
*Cordylanthus tenuis*  
*Cordylanthus viscidus*  
*Coreopsis tinctoria*  
*Coriandrum sativum*  
*Corispermum hyssopifolium*  
*Corispermum nitidum*  
*Corispermum orientale*  
*Corispermum sibericum*  
*Cornus alba*  
*Cornus canadensis*  
*Cornus drummondii*  
*Cornus foemina*  
*Cornus glabrata*  
*Cornus mas*  
*Cornus nuttallii*  
*Cornus occidentalis*  
*Cornus stolonifera*  
*Coronilla varia*  
*Coronopus didymus*  
*Corydalis aquae-gelidae*  
*Corydalis aurea*  
*Corydalis caseana*  
*Corydalis cusickii*  
*Corydalis lutea*  
*Corydalis scouleri*  
*Corydalis sempervirens*  
*Corylus americana*  
*Corylus avellana*  
*Corylus column*  
*Corylus cornuta*  
*Coryphantha missouriensis*  
*Coryphantha vivipara*  
*Cotinus coggygia*  
*Cotoneaster acutifolius*  
*Cotoneaster bullatus*  
*Cotoneaster foveolata*  
*Cotoneaster franchetti*  
*Cotoneaster lactea*  
*Cotoneaster lucidus*  
*Cotoneaster tenuipes*  
*Cotoneaster tomentosus*  
*Cotula coronopifolia*  
*Cowania mexicana*  
*Crassula aquatica*

*Crassula connata*  
*Crassula viridis*  
*Crataegus columbiana*  
*Crataegus douglasii*  
*Crataegus mollis*  
*Crataegus monogyna*  
*Crataegus oxycantha*  
*Crataegus succulenta*  
*Crataegus suksdorfii*  
*Crataegus carrierei*  
*Crepis acuminata*  
*Crepis atribarba*  
*Crepis bakeri*  
*Crepis barbiger*  
*Crepis capillaris*  
*Crepis elegans*  
*Crepis intermedia*  
*Crepis modocensis*  
*Crepis monticola*  
*Crepis nana*  
*Crepis nicaeensis*  
*Crepis occidentalis*  
*Crepis pleurocarpa*  
*Crepis runcinata*  
*Crepis setosa*  
*Crepis tectorum*  
*Crocidium multicaule*  
*Crococoma X crocosmiiflora*  
*Crococoma masoniorum*  
*Crococoma pottsi*  
*Croton capitatus*  
*Croton texensis*  
*Crucianella angustifolia*  
*Crupina vulgaris*  
*Crypsis alopecuroides*  
*Crypsis vaginiflora*  
*Cryptantha affinis*  
*Cryptantha ambigua*  
*Cryptantha breviflora*  
*Cryptantha caespitosa*  
*Cryptantha cana*  
*Cryptantha celosoides*  
*Cryptantha circumscissa*  
*Cryptantha echinella*  
*Cryptantha fendleri*  
*Cryptantha flaccida*  
*Cryptantha flava*  
*Cryptantha flavoculata*  
*Cryptantha fulvocanescens*  
*Cryptantha gracilis*  
*Cryptantha humilis*  
*Cryptantha intermedia*  
*Cryptantha interrupta*  
*Cryptantha jamesii*

*Cryptantha kelseiana*  
*Cryptantha leiocarpa*  
*Cryptantha leucophaea*  
*Cryptantha milobakeri*  
*Cryptantha minima*  
*Cryptantha muriculata*  
*Cryptantha nevadensis*  
*Cryptantha nubigena*  
*Cryptantha propria*  
*Cryptantha pterocarya*  
*Cryptantha recurvata*  
*Cryptantha rustellata*  
*Cryptantha rugulosa*  
*Cryptantha salmonensis*  
*Cryptantha scoparia*  
*Cryptantha sericea*  
*Cryptantha simulans*  
*Cryptantha stricta*  
*Cryptantha subcapitata*  
*Cryptantha thompsonii*  
*Cryptantha thyrsiflora*  
*Cryptantha torreyana*  
*Cryptantha watsonii*  
*Cryptogramma cascadenis*  
*Cryptogramma crispa*  
*Cryptogramma densa*  
*Cryptogramma stelleri*  
*Cryptomeria japonica*  
*Cryptotaenia canadensis*  
*Cucumis anguria*  
*Cucumis melo*  
*Cunninghamia lanceolata*  
*Cuphea hyssopifolia*  
*Cupressus bakeri*  
*Cupressus macrocarpa*  
*Cupressus sempervirens*  
*Cuscuta approximata*  
*Cuscuta californica*  
*Cuscuta cephalanthi*  
*Cuscuta coryli*  
*Cuscuta cuspidata*  
*Cuscuta denticulata*  
*Cuscuta dodder*  
*Cuscuta epithymum*  
*Cuscuta glomerata*  
*Cuscuta gronovii*  
*Cuscuta indecora*  
*Cuscuta occidentalis*  
*Cuscuta pentagona*  
*Cuscuta planiflora*  
*Cuscuta polygonorum*  
*Cuscuta salina*  
*Cuscuta spp.*  
*Cuscuta subinclusa*

*Cuscuta suksdorfii*  
*Cycloloma atriplicifolium*  
*Cydonia oblonga*  
*Cydonia sinensis*  
*Cymbalaria muralis*  
*Cymopterus acaulis*  
*Cymopterus bipinnatus*  
*Cymopterus corrugatus*  
*Cymopterus davisii*  
*Cymopterus douglassii*  
*Cymopterus evertii*  
*Cymopterus glaucus*  
*Cymopterus hendersonii*  
*Cymopterus ibapensis*  
*Cymopterus longipes*  
*Cymopterus montanus*  
*Cymopterus nivalis*  
*Cymopterus petraeus*  
*Cymopterus purpurascens*  
*Cymopterus terebinthinus*  
*Cymopterus watsoni*  
*Cymopterus williamsii*  
*Cynara cardunculus*  
*Cynara scolymus*  
*Cynodon dactylon*  
*Cynoglossum boreale*  
*Cynoglossum echinatus*  
*Cynoglossum grande*  
*Cynoglossum occidentale*  
*Cynoglossum officinale*  
*Cynosurus cristatus*  
*Cynosurus echinatus*  
*Cyperus acuminatus*  
*Cyperus aristatus*  
*Cyperus bipartitus*  
*Cyperus diandrus*  
*Cyperus engelmannii*  
*Cyperus eragrostis*  
*Cyperus erythrorhizos*  
*Cyperus esculentus*  
*Cyperus lupulinus*  
*Cyperus odoratus*  
*Cyperus rivularis*  
*Cyperus rotundus*  
*Cyperus schweinitzii*  
*Cyperus strigosus*  
*Cypripedium X andrewsii*  
*Cypripedium calceolus*  
*Cypripedium californicum*  
*Cypripedium candidum*  
*Cypripedium fasciculatum*  
*Cypripedium montanum*  
*Cypripedium passerinum*  
*Cypripedium reginae*

*Cystopteris bulbifera*  
*Cystopteris fragilis*  
*Cystopteris montana*  
*Cytisus monspessulanus*  
*Cytisus multiflorus*  
*Cytisus praecox*  
*Cytisus scoparius*  
*Dactylis glomerata*  
*Dalea aurea*  
*Dalea candida*  
*Dalea cylindriceps*  
*Dalea enneandra*  
*Dalea leporina*  
*Dalea purpurea*  
*Dalea searlsiae*  
*Dalea villosa*  
*Damasonium californicum*  
*Danthonia californica*  
*Danthonia intermedia*  
*Danthonia parryi*  
*Danthonia spicata*  
*Danthonia unispicata*  
*Daphne X burkwoodii*  
*Daphne cneorum*  
*Daphne laureola*  
*Daphne mezereum*  
*Dasynotus daubenmirei*  
*Datura innoxia*  
*Datura stramonium*  
*Daucus carota*  
*Daucus pusillus*  
*Delphinium X xylorrhizum*  
*Delphinium ajacis*  
*Delphinium andersonii*  
*Delphinium barbeyi*  
*Delphinium bicolor*  
*Delphinium burkei*  
*Delphinium columbianum*  
*Delphinium cyanoreios*  
*Delphinium decorum*  
*Delphinium depauperatum*  
*Delphinium distichum*  
*Delphinium geyeri*  
*Delphinium glareosum*  
*Delphinium glaucum*  
*Delphinium gracilentum*  
*Delphinium leucophaeum*  
*Delphinium lineapetalum*  
*Delphinium menziesii*  
*Delphinium multiflorum*  
*Delphinium multiplex*  
*Delphinium nelsonii*  
*Delphinium nudicaule*  
*Delphinium nuttallianum*

*Delphinium nuttallii*  
*Delphinium occidentale*  
*Delphinium oreganum*  
*Delphinium pavonaceum*  
*Delphinium simplex*  
*Delphinium sonnei*  
*Delphinium stachydeum*  
*Delphinium trollifolium*  
*Delphinium viridescens*  
*Delphinium xantholeucum*  
*Dentaria cardiophylla*  
*Dentaria gemmata*  
*Dentaria grandiflora*  
*Dentaria tenella*  
*Deschampsia atropurpurea*  
*Deschampsia danthonioides*  
*Deschampsia elongata*  
*Descurainia californica*  
*Descurainia incana*  
*Descurainia incisa*  
*Descurainia longipedicellata*  
*Descurainia pinnata*  
*Descurainia richardsonii*  
*Descurainia sophia*  
*Descurainia torulosa*  
*Desmanthus illinoensis*  
*Desmodium canadense*  
*Desmodium glutinosum*  
*Deutzia scabra*  
*Dianthus armeria*  
*Dianthus barbatus*  
*Dianthus deltoides*  
*Dicentra cucullaria*  
*Dicentra formosa*  
*Dicentra pauciflora*  
*Dicentra uniflora*  
*Dichelostemma ida-maia*  
*Dichelostemma venustum*  
*Diervilla lonicera*  
*Digitalis purpurea*  
*Digitaria abyssinica*  
*Digitaria ischaemum*  
*Digitaria sanguinalis*  
*Digitaria scalarum*  
*Digitaria velutina*  
*Dimeresia howellii*  
*Dioscorea batatas*  
*Diplotaxis muralis*  
*Dipsacus fullonum*  
*Dirca palustris*  
*Disporum hookeri*  
*Disporum smithii*  
*Disporum trachycarpum*  
*Distichlis spicata*

*Dodecatheon alpinum*  
*Dodecatheon austrofrigidum*  
*Dodecatheon conjugens*  
*Dodecatheon dentatum*  
*Dodecatheon hendersonii*  
*Dodecatheon jeffreyi*  
*Dodecatheon poeticum*  
*Dodecatheon pulchellum*  
*Dodecatheon tetrandrum*  
*Doronicum plantagineum*  
*Douglasia idahoensis*  
*Douglasia laevigata*  
*Douglasia montana*  
*Douglasia nivalis*  
*Downingia bacigalupii*  
*Downingia bicornuta*  
*Downingia elegans*  
*Downingia laeta*  
*Downingia pulchella*  
*Downingia willamettensis*  
*Downingia yina*  
*Draba albertina*  
*Draba apiculata*  
*Draba argyraea*  
*Draba aurea*  
*Draba aureola*  
*Draba borealis*  
*Draba brachycarpa*  
*Draba camosula*  
*Draba crassa*  
*Draba crassifolia*  
*Draba cuneifolia*  
*Draba densifolia*  
*Draba douglasii*  
*Draba fladnizensis*  
*Draba glabella*  
*Draba glacialis*  
*Draba hitchcockii*  
*Draba howellii*  
*Draba incerta*  
*Draba lanceolata*  
*Draba lemmonii*  
*Draba lonchocarpa*  
*Draba longipes*  
*Draba luteola*  
*Draba macounii*  
*Draba nemorosa*  
*Draba nitida*  
*Draba nivalis*  
*Draba oligosperma*  
*Draba oreibata*  
*Draba paysonii*  
*Draba pectinata*  
*Draba porsildii*

*Draba praealta*  
*Draba reptans*  
*Draba ruaxes*  
*Draba sphaerioides*  
*Draba sphaerocarpa*  
*Draba stenoloba*  
*Draba trichocarpa*  
*Draba ventosa*  
*Draba verna*  
*Dracocephalum nuttallii*  
*Dracocephalum parviflorum*  
*Dracocephalum thymiflorum*  
*Dracopis amplexicaulis*  
*Dracunculus vulgaris*  
*Drosera anglica*  
*Drosera linearis*  
*Drosera longifolia*  
*Drosera rotundifolia*  
*Dryas drummondii*  
*Dryas integrifolia*  
*Dryas octopetala*  
*Drymaria arenarioides*  
*Dryopteris X uliginosa*  
*Dryopteris arguta*  
*Dryopteris cristata*  
*Dryopteris disjuncta*  
*Dryopteris filix-mas*  
*Dryopteris spinulosa*  
*Dudleya farinosa*  
*Dulichium arundinaceum*  
*Dyssodia papposa*  
*Eatonella nivea*  
*Eatonia intermedia*  
*Eburopyhton austiniiae*  
*Echinacea angustifolia*  
*Echinocereus engelmannii*  
*Echinochloa colona*  
*Echinochloa crussgalli*  
*Echinochloa muricata*  
*Echinocystis lobata*  
*Echinops exaltatus*  
*Echinops ritro*  
*Echinops ruthenicus*  
*Echinops sphaerocephalus*  
*Echium vulgare*  
*Edwardii tedi*  
*Egeria densa*  
*Eichhornia azurea*  
*Eiogonum proliferum*  
*Elaeagnus angustifolia*  
*Elaeagnus commutata*  
*Elaeagnus multiflora*  
*Elaeagnus umbellata*  
*Elatine brachysperma*

*Elatine californica*  
*Elatine triandra*  
*Eleocharis acicularis*  
*Eleocharis atropurpurea*  
*Eleocharis bella*  
*Eleocharis bolanderi*  
*Eleocharis compressa*  
*Eleocharis flavescens*  
*Eleocharis montevidensis*  
*Eleocharis obtusa*  
*Eleocharis palustris*  
*Eleocharis parvula*  
*Eleocharis pauciflora*  
*Eleocharis rostellata*  
*Eleocharis smallii*  
*Eleocharis tenuis*  
*Eleocharis wolffii*  
*Eleusine indica*  
*Ellisia nyctelea*  
*Elmera racemosa*  
*Elodea bifoliata*  
*Elodea canadensis*  
*Elodea longivaginata*  
*Elodea nuttallii*  
*Elodea schweinitzii*  
*Elsholtzia ciliata*  
*Elyhordeum X macounii*  
*Elyhordeum X montanense*  
*Elyleymus X aristatus*  
*Elymus X hansenii*  
*Elymus X pseudorepens*  
*Elymus X saundersii*  
*Elymus X saxicolus*  
*Elymus ambiguus*  
*Elymus arenicola*  
*Elymus aristatus*  
*Elymus brevifolius*  
*Elymus canadensis*  
*Elymus caput-medusae*  
*Elymus cinereus*  
*Elymus condensatus*  
*Elymus diversigligumis*  
*Elymus flavescens*  
*Elymus glaucus*  
*Elymus hirsutus*  
*Elymus innovatus*  
*Elymus junceus*  
*Elymus macounii*  
*Elymus mollis*  
*Elymus pungens*  
*Elymus racemosa*  
*Elymus triticoides*  
*Elymus villosus*  
*Elymus virginicus*

*Emex australis*  
*Emex spinosa*  
*Empetrum nigrum*  
*Enceliopsis nudicaulis*  
*Ephedra nevadensis*  
*Ephedra viridis*  
*Epilobium alpinum*  
*Epilobium angustifolium*  
*Epilobium brachycarpum*  
*Epilobium brevistylum*  
*Epilobium canum*  
*Epilobium ciliatum*  
*Epilobium coloratum*  
*Epilobium exaltatum*  
*Epilobium fastigiatum*  
*Epilobium glaberrimum*  
*Epilobium halleanum*  
*Epilobium hirsutum*  
*Epilobium juncundum*  
*Epilobium latifolium*  
*Epilobium leptophyllum*  
*Epilobium luteum*  
*Epilobium minutum*  
*Epilobium nivium*  
*Epilobium obcordatum*  
*Epilobium occidentale*  
*Epilobium palustre*  
*Epilobium paniculatum*  
*Epilobium pringleanum*  
*Epilobium rigidum*  
*Epilobium siskiyouense*  
*Epilobium suffruticosum*  
*Epilobium ursinum*  
*Epipactis gigantea*  
*Epipactis helleborine*  
*Equisetum X ferrissii*  
*Equisetum X mackaii*  
*Equisetum X nelsonii*  
*Equisetum arvense*  
*Equisetum fluviatile*  
*Equisetum hyemale*  
*Equisetum laevigatum*  
*Equisetum litorale*  
*Equisetum palustre*  
*Equisetum pratense*  
*Equisetum prealtum*  
*Equisetum scirpoides*  
*Equisetum sylvaticum*  
*Equisetum telmateia*  
*Equisetum variegatum*  
*Eragrostis cilianensis*  
*Eragrostis curvula*  
*Eragrostis hypnoides*  
*Eragrostis lutescens*

*Eragrostis mexicana*  
*Eragrostis minor*  
*Eragrostis multicaulis*  
*Eragrostis orcuttiana*  
*Eragrostis pectinacea*  
*Eragrostis pilosa*  
*Eragrostis reptans*  
*Eragrostis spectabilis*  
*Erechtites arguta*  
*Erechtites hieracifolia*  
*Erechtites minima*  
*Erechtites prenanthoides*  
*Erectites minima*  
*Eremocarpus setigerus*  
*Eremurus X warei*  
*Eriastrum sparsiflorum*  
*Eriocameria discoidea*  
*Erigeron acris*  
*Erigeron aliceae*  
*Erigeron allocotus*  
*Erigeron annuus*  
*Erigeron annuus*  
*Erigeron aphanactis*  
*Erigeron argentatus*  
*Erigeron asperugineus*  
*Erigeron aureus*  
*Erigeron basalticus*  
*Erigeron bellidiastrium*  
*Erigeron bloomeri*  
*Erigeron caespitosus*  
*Erigeron canus*  
*Erigeron cascadiensis*  
*Erigeron cervinus*  
*Erigeron chrysopsidis*  
*Erigeron compositus*  
*Erigeron concinnus*  
*Erigeron corymbosus*  
*Erigeron coulteri*  
*Erigeron cronquistii*  
*Erigeron decumbens*  
*Erigeron delicatus*  
*Erigeron disparipilus*  
*Erigeron divergens*  
*Erigeron eatonii*  
*Erigeron elatior*  
*Erigeron elegantulus*  
*Erigeron engelmannii*  
*Erigeron evermannii*  
*Erigeron filifolius*  
*Erigeron flabellifolius*  
*Erigeron flagellaris*  
*Erigeron flettii*  
*Erigeron foliosus*  
*Erigeron formosissimus*

*Delphinium nuttallii*  
*Delphinium occidentale*  
*Delphinium oreganum*  
*Delphinium pavonaceum*  
*Delphinium simplex*  
*Delphinium sonnei*  
*Delphinium stachydeum*  
*Delphinium trollifolium*  
*Delphinium viridescens*  
*Delphinium xantholeucum*  
*Dentaria cardiophylla*  
*Dentaria gemmata*  
*Dentaria grandiflora*  
*Dentaria tenella*  
*Deschampsia atropurpurea*  
*Deschampsia danthonioides*  
*Deschampsia elongata*  
*Descurainia californica*  
*Descurainia incana*  
*Descurainia incisa*  
*Descurainia longipedicellata*  
*Descurainia pinnata*  
*Descurainia richardsonii*  
*Descurainia sophia*  
*Descurainia torulosa*  
*Desmanthus illinoensis*  
*Desmodium canadense*  
*Desmodium glutinosum*  
*Deutzia scabra*  
*Dianthus armeria*  
*Dianthus barbatus*  
*Dianthus deltoides*  
*Dicentra cucullaria*  
*Dicentra formosa*  
*Dicentra pauciflora*  
*Dicentra uniflora*  
*Dichelostemma ida-maia*  
*Dichelostemma venustum*  
*Diervilla lonicera*  
*Digitalis purpurea*  
*Digitalis abyssinica*  
*Digitalis ischaemum*  
*Digitalis sanguinalis*  
*Digitalis scalarum*  
*Digitalis velutina*  
*Dimeresia howellii*  
*Dioscorea batatas*  
*Diplotaxis muralis*  
*Dipsacus fullonum*  
*Dirca palustris*  
*Disporum hookeri*  
*Disporum smithii*  
*Disporum trachycarpum*  
*Distichlis spicata*

*Dodecatheon alpinum*  
*Dodecatheon austrofrigidum*  
*Dodecatheon conjugens*  
*Dodecatheon dentatum*  
*Dodecatheon hendersonii*  
*Dodecatheon jeffreyi*  
*Dodecatheon poeticum*  
*Dodecatheon pulchellum*  
*Dodecatheon tetrandrum*  
*Doronicum plantagineum*  
*Douglasia idahoensis*  
*Douglasia laevigata*  
*Douglasia montana*  
*Douglasia nivalis*  
*Downingia bacigalupii*  
*Downingia bicornuta*  
*Downingia elegans*  
*Downingia laeta*  
*Downingia pulchella*  
*Downingia willamettensis*  
*Downingia yina*  
*Draba albertina*  
*Draba apiculata*  
*Draba argyrea*  
*Draba aurea*  
*Draba aureola*  
*Draba borealis*  
*Draba brachycarpa*  
*Draba carnosula*  
*Draba crassa*  
*Draba crassifolia*  
*Draba cuneifolia*  
*Draba densifolia*  
*Draba douglasii*  
*Draba fladnizensis*  
*Draba glabella*  
*Draba glacialis*  
*Draba hitchcockii*  
*Draba howellii*  
*Draba incerta*  
*Draba lanceolata*  
*Draba lemmonii*  
*Draba lonchocarpa*  
*Draba longipes*  
*Draba luteola*  
*Draba macounii*  
*Draba nemorosa*  
*Draba nitida*  
*Draba nivalis*  
*Draba oligosperma*  
*Draba oreibata*  
*Draba paysonii*  
*Draba pectinata*  
*Draba porsildii*

*Draba praealta*  
*Draba reptans*  
*Draba ruaxes*  
*Draba sphaerioides*  
*Draba sphaerocarpa*  
*Draba stenoloba*  
*Draba trichocarpa*  
*Draba ventosa*  
*Draba verna*  
*Dracocephalum nuttallii*  
*Dracocephalum parviflorum*  
*Dracocephalum thymiflorum*  
*Dracopis amplexicaulis*  
*Dracunculus vulgaris*  
*Drosera anglica*  
*Drosera linearis*  
*Drosera longifolia*  
*Drosera rotundifolia*  
*Dryas drummondii*  
*Dryas integrifolia*  
*Dryas octopetala*  
*Drymaria arenarioides*  
*Dryopteris X uliginosa*  
*Dryopteris arguta*  
*Dryopteris cristata*  
*Dryopteris disjuncta*  
*Dryopteris filix-mas*  
*Dryopteris spinulosa*  
*Dudleya farinosa*  
*Dulichium arundinaceum*  
*Dyssodia papposa*  
*Eatonella nivea*  
*Eatonia intermedia*  
*Eburophyton austiniacae*  
*Echinacea angustifolia*  
*Echinocereus engelmannii*  
*Echinochloa colona*  
*Echinochloa crussgalli*  
*Echinochloa muricata*  
*Echinocystis lobata*  
*Echinops exaltatus*  
*Echinops ritro*  
*Echinops ruthenicus*  
*Echinops sphaerocephalus*  
*Echium vulgare*  
*Edwardii tedi*  
*Egeria densa*  
*Eichhornia azurea*  
*Eiogonum proliferum*  
*Elaeagnus angustifolia*  
*Elaeagnus commutata*  
*Elaeagnus multiflora*  
*Elaeagnus umbellata*  
*Elatine brachysperma*

*Elatine californica*  
*Elatine triandra*  
*Eleocharis acicularis*  
*Eleocharis atropurpurea*  
*Eleocharis bella*  
*Eleocharis bolanderi*  
*Eleocharis compressa*  
*Eleocharis flavescens*  
*Eleocharis montevidensis*  
*Eleocharis obtusa*  
*Eleocharis palustris*  
*Eleocharis parvula*  
*Eleocharis pauciflora*  
*Eleocharis rostellata*  
*Eleocharis smallii*  
*Eleocharis tenuis*  
*Eleocharis wolfii*  
*Eleusine indica*  
*Ellisia nyctelea*  
*Elmera racemosa*  
*Elodea bifoliata*  
*Elodea canadensis*  
*Elodea longivaginata*  
*Elodea nuttallii*  
*Elodea schweinitzii*  
*Elsholtzia ciliata*  
*Elyhordeum X macounii*  
*Elyhordeum X montanense*  
*Elyleymus X aristatus*  
*Elymus X hansenii*  
*Elymus X pseudorepens*  
*Elymus X saundersii*  
*Elymus X saxicolus*  
*Elymus ambiguus*  
*Elymus arenicola*  
*Elymus aristatus*  
*Elymus brevifolius*  
*Elymus canadensis*  
*Elymus caput-medusae*  
*Elymus cinereus*  
*Elymus condensatus*  
*Elymus diversiglumis*  
*Elymus flavescens*  
*Elymus glaucus*  
*Elymus hirsutus*  
*Elymus innovatus*  
*Elymus junceus*  
*Elymus macounii*  
*Elymus mollis*  
*Elymus pungens*  
*Elymus racemosa*  
*Elymus triticoides*  
*Elymus villosus*  
*Elymus virginicus*

*Emex australis*  
*Emex spinosa*  
*Empetrum nigrum*  
*Enceliopsis nudicaulis*  
*Ephedra nevadensis*  
*Ephedra viridis*  
*Epilobium alpinum*  
*Epilobium angustifolium*  
*Epilobium brachycarpum*  
*Epilobium brevistylum*  
*Epilobium canum*  
*Epilobium ciliatum*  
*Epilobium coloratum*  
*Epilobium exaltatum*  
*Epilobium fastigiatum*  
*Epilobium glaberrimum*  
*Epilobium halleanum*  
*Epilobium hirsutum*  
*Epilobium juncundum*  
*Epilobium latifolium*  
*Epilobium leptophyllum*  
*Epilobium luteum*  
*Epilobium minutum*  
*Epilobium nivium*  
*Epilobium obcordatum*  
*Epilobium occidentale*  
*Epilobium palustre*  
*Epilobium paniculatum*  
*Epilobium pringleanum*  
*Epilobium rigidum*  
*Epilobium siskiyouense*  
*Epilobium suffruticosum*  
*Epilobium ursinum*  
*Epipactis gigantea*  
*Epipactis helleborine*  
*Equisetum X ferrissii*  
*Equisetum X mackaii*  
*Equisetum X nelsonii*  
*Equisetum arvense*  
*Equisetum fluviatile*  
*Equisetum hyemale*  
*Equisetum laevigatum*  
*Equisetum litorale*  
*Equisetum palustre*  
*Equisetum pratense*  
*Equisetum prealtum*  
*Equisetum scirpoides*  
*Equisetum sylvaticum*  
*Equisetum telmateia*  
*Equisetum variegatum*  
*Eragrostis cilianensis*  
*Eragrostis curvula*  
*Eragrostis hypnoides*  
*Eragrostis lutescens*

*Eragrostis mexicana*  
*Eragrostis minor*  
*Eragrostis multicaulis*  
*Eragrostis orcutiana*  
*Eragrostis pectinacea*  
*Eragrostis pilosa*  
*Eragrostis reptans*  
*Eragrostis spectabilis*  
*Erechtites arguta*  
*Erechtites hieracifolia*  
*Erechtites minima*  
*Erechtites prenanthoides*  
*Erectites minima*  
*Eremocarpus setigerus*  
*Eremurus X warei*  
*Eriastrum sparsiflorum*  
*Ericameria discoidea*  
*Erigeron acris*  
*Erigeron alicaeae*  
*Erigeron allocotus*  
*Erigeron annuus*  
*Erigeron annuus*  
*Erigeron aphanactis*  
*Erigeron argentatus*  
*Erigeron asperugineus*  
*Erigeron aureus*  
*Erigeron basalticus*  
*Erigeron bellidiastrum*  
*Erigeron bloomeri*  
*Erigeron caespitosus*  
*Erigeron canus*  
*Erigeron cascadenis*  
*Erigeron cervinus*  
*Erigeron chrysopsidis*  
*Erigeron compositus*  
*Erigeron concinnus*  
*Erigeron corymbosus*  
*Erigeron coulteri*  
*Erigeron cronquistii*  
*Erigeron decumbens*  
*Erigeron delicatus*  
*Erigeron disparipilus*  
*Erigeron divergens*  
*Erigeron eatonii*  
*Erigeron elatior*  
*Erigeron elegantulus*  
*Erigeron engelmannii*  
*Erigeron evermannii*  
*Erigeron filifolius*  
*Erigeron flabellifolius*  
*Erigeron flagellaris*  
*Erigeron flettii*  
*Erigeron foliosus*  
*Erigeron formosissimus*

*Erigeron glabellus*  
*Erigeron glaucus*  
*Erigeron gracilis*  
*Erigeron grandiflorus*  
*Erigeron howellii*  
*Erigeron humilis*  
*Erigeron inomatus*  
*Erigeron lackschewitzii*  
*Erigeron lanatus*  
*Erigeron leibergii*  
*Erigeron leiomerus*  
*Erigeron linearis*  
*Erigeron lonchophyllus*  
*Erigeron macranthus*  
*Erigeron nanus*  
*Erigeron nevadincola*  
*Erigeron ochroleucus*  
*Erigeron oreganus*  
*Erigeron pallens*  
*Erigeron peregrinus*  
*Erigeron petrophilus*  
*Erigeron peucephyllus*  
*Erigeron philadelphicus*  
*Erigeron piperianus*  
*Erigeron poliospermus*  
*Erigeron pulcherrimus*  
*Erigeron pumilus*  
*Erigeron radiatus*  
*Erigeron rydbergii*  
*Erigeron salishii*  
*Erigeron salmonensis*  
*Erigeron salsuginosus*  
*Erigeron simplex*  
*Erigeron speciosus*  
*Erigeron strigosus*  
*Erigeron subtrinervis*  
*Erigeron tener*  
*Erigeron tweedyi*  
*Erigeron ursinus*  
*Erigeron vagus*  
*Eriogonum X lagopus*  
*Eriogonum acaule*  
*Eriogonum alatum*  
*Eriogonum androsaceum*  
*Eriogonum angulosum*  
*Eriogonum annuum*  
*Eriogonum baileyi*  
*Eriogonum caespitosum*  
*Eriogonum capistratum*  
*Eriogonum cernuum*  
*Eriogonum chrysocephalum*  
*Eriogonum chrysops*  
*Eriogonum compositum*  
*Eriogonum congdonii*

*Eriogonum cusickii*  
*Eriogonum deflexum*  
*Eriogonum desertorum*  
*Eriogonum dichotomum*  
*Eriogonum diclinum*  
*Eriogonum douglasii*  
*Eriogonum effusum*  
*Eriogonum elatum*  
*Eriogonum flavum*  
*Eriogonum heermanii*  
*Eriogonum heracleoides*  
*Eriogonum hirtellum*  
*Eriogonum hookeri*  
*Eriogonum incanum*  
*Eriogonum inerme*  
*Eriogonum kingii*  
*Eriogonum latifolium*  
*Eriogonum lewisii*  
*Eriogonum lobbiai*  
*Eriogonum maculatum*  
*Eriogonum mancum*  
*Eriogonum marifolium*  
*Eriogonum meledonum*  
*Eriogonum microthecum*  
*Eriogonum nidularium*  
*Eriogonum niveum*  
*Eriogonum novundum*  
*Eriogonum nudum*  
*Eriogonum ochrocephalum*  
*Eriogonum ovalifolium*  
*Eriogonum palmerianum*  
*Eriogonum pauciflorum*  
*Eriogonum pendulum*  
*Eriogonum piperi*  
*Eriogonum prociduum*  
*Eriogonum proliferum*  
*Eriogonum pusillum*  
*Eriogonum pyrolifolium*  
*Eriogonum salicornioides*  
*Eriogonum salsuginosum*  
*Eriogonum scopulorum*  
*Eriogonum shockleyi*  
*Eriogonum siskiyouense*  
*Eriogonum sp. nov. war eagle mtn.*  
*Eriogonum speciosum*  
*Eriogonum spergulinum*  
*Eriogonum sphaerocephalum*  
*Eriogonum stellatum*  
*Eriogonum strictum*  
*Eriogonum subalpinum*  
*Eriogonum ternatum*  
*Eriogonum thymoides*  
*Eriogonum tolmieanum*

*Eriogonum umbellatum*  
*Eriogonum vimineum*  
*Eriogonum visleri*  
*Eriogonum watsonii*  
*Eriogonum pilosum*  
*Eriophorum brachyantherum*  
*Eriophorum callitrix*  
*Eriophorum chamissonis*  
*Eriophorum gracile*  
*Eriophorum polystachion*  
*Eriophorum scheuchzeri*  
*Eriophorum virginicum*  
*Eriophorum viridicarinatum*  
*Eriophyllum lanatum*  
*Eriophyllum lanceolatum*  
*Eriophyllum staechadifolium*  
*Eriophyllum watsoni*  
*Eritrichium elongatum*  
*Eritrichium howardii*  
*Eritrichium nanum*  
*Erodium botrys*  
*Erodium cicutarium*  
*Erodium moschatum*  
*Erodium obtusiplicatum*  
*Eruca sativa*  
*Erucastrium gallicum*  
*Eryngium alismifolium*  
*Eryngium articulatum*  
*Eryngium petiolatum*  
*Erysimum arenicola*  
*Erysimum asperum*  
*Erysimum cheiranthoides*  
*Erysimum concinnum*  
*Erysimum elatum*  
*Erysimum franciscanum*  
*Erysimum inconspicuum*  
*Erysimum occidentale*  
*Erysimum repandum*  
*Erysimum torulosum*  
*Erythronium citrinum*  
*Erythronium grandiflorum*  
*Erythronium hendersonii*  
*Erythronium howellii*  
*Erythronium klamathense*  
*Erythronium montanum*  
*Erythronium nudopetalum*  
*Erythronium oregonum*  
*Erythronium revolutum*  
*Escallonia X langleyensis*  
*Escallonia rubra*  
*Eschscholzia caespitosa*  
*Eschscholzia californica*  
*Eschscholzia leptandra*  
*Escobaria missouriensis*

*Escobaria vivipara*  
*Euclidium syriacum*  
*Euonymus alata*  
*Euonymus atropurpureus*  
*Euonymus europaea*  
*Euonymus fortunei*  
*Euonymus nana*  
*Euonymus occidentalis*  
*Eupatorium adenophorum*  
*Eupatorium maculatum*  
*Eupatorium occidentale*  
*Eupatorium perfoliatum*  
*Eupatorium rugosum*  
*Euphorbia X pseudovirgata*  
*Euphorbia agraria*  
*Euphorbia crenulata*  
*Euphorbia cyparissias*  
*Euphorbia dentata*  
*Euphorbia epichymoides*  
*Euphorbia esula*  
*Euphorbia fendleri*  
*Euphorbia geyeri*  
*Euphorbia glyptosperma*  
*Euphorbia helioscopia*  
*Euphorbia hexagona*  
*Euphorbia lathyris*  
*Euphorbia maculata*  
*Euphorbia maculosa*  
*Euphorbia marginata*  
*Euphorbia missurica*  
*Euphorbia myrsinites*  
*Euphorbia nutans*  
*Euphorbia peplus*  
*Euphorbia prunifolia*  
*Euphorbia pulcherima*  
*Euphorbia robusta*  
*Euphorbia serpens*  
*Euphorbia serpyllifolia*  
*Euphorbia spatulata*  
*Euphorbia stictospora*  
*Euphrasia arctica*  
*Euphrasia officinalis*  
*Evolvulus nuttallianus*  
*Fagopyrum esculentum*  
*Fagopyrum tartaricum*  
*Fagus sylvatica*  
*Fatsia japonica*  
*Festuca X viviparoidea*  
*Festuca arida*  
*Festuca arizonica*  
*Festuca arundinacea*  
*Festuca baffinensis*  
*Festuca bromoides*  
*Festuca californica*

*Festuca dertonensis*  
*Festuca elmeri*  
*Festuca grayi*  
*Festuca hallii*  
*Festuca idahoensis*  
*Festuca megalura*  
*Festuca microstachys*  
*Festuca myuros*  
*Festuca obtusa*  
*Festuca occidentalis*  
*Festuca octoflora*  
*Festuca ovina*  
*Festuca pacifica*  
*Festuca pratensis*  
*Festuca reflexa*  
*Festuca rubra*  
*Festuca scabrella*  
*Festuca subulata*  
*Festuca subuliflora*  
*Festuca viridula*  
*Festuca vivipara*  
*Filago arvensis*  
*Filago californica*  
*Filipendula occidentalis*  
*Filipendula rubra*  
*Filipendula vulgaris*  
*Floerkea proserpinacoides*  
*Foeniculum vulgare*  
*Forsellesia spinescens*  
*Forsythia suspensa*  
*Fragaria bracteata*  
*Fragaria californica*  
*Fragaria chiloensis*  
*Fragaria crinata*  
*Fragaria cuneifolia*  
*Fragaria glauca*  
*Fragaria platypetala*  
*Fragaria vesca*  
*Fragaria virginiana*  
*Franseria bipinnatifida*  
*Franseria chamissonis*  
*Frasera albicaulis*  
*Frasera californica*  
*Frasera fastigiata*  
*Frasera montana*  
*Frasera nitida*  
*Frasera speciosa*  
*Frasera umpquaensis*  
*Fraxinus latifolia*  
*Fraxinus nigra*  
*Fraxinus pennsylvanica*  
*Fritillaria atropurpurea*  
*Fritillaria camschatcensis*  
*Fritillaria camschatcensis*

*Fritillaria falcata*  
*Fritillaria gentneri*  
*Fritillaria glauca*  
*Fritillaria imperialis*  
*Fritillaria lanceolata*  
*Fritillaria pluriflora*  
*Fritillaria pudica*  
*Fritillaria purdyi*  
*Fritillaria recurva*  
*Fumaria officinalis*  
*Fumaria parviflora*  
*Gaillardia aristata*  
*Gaillardia pulchella*  
*Galega officinalis*  
*Galeopsis tetrahit*  
*Galinsooga parviflora*  
*Galinsooga quadriradiata*  
*Galium ambiguum*  
*Galium andrewsii*  
*Galium aparine*  
*Galium asperum*  
*Galium bifolium*  
*Galium bolanderi*  
*Galium boreale*  
*Galium cymosum*  
*Galium grayanum*  
*Galium humifusum*  
*Galium hypotrichum*  
*Galium kamtschaticum*  
*Galium labradoricum*  
*Galium matthewsii*  
*Galium mollugo*  
*Galium multiflorum*  
*Galium muricatum*  
*Galium nuttallii*  
*Galium obtusum*  
*Galium oreganum*  
*Galium palustre*  
*Galium pedemontanum*  
*Galium sparsiflora*  
*Galium trifidum*  
*Galium triflorum*  
*Galium vaillantii*  
*Galium verum*  
*Garrya buxifolia*  
*Garrya elliptica*  
*Garrya flavescens*  
*Garrya fremontii*  
*Gastridium ventricosum*  
*Gaultheria hispida*  
*Gaultheria humifusa*  
*Gaultheria ovatifolia*  
*Gaultheria shallon*  
*Gaura coccinea*

*Gaura neomexicana*  
*Gaura parviflora*  
*Gayophytum caesium*  
*Gayophytum decipiens*  
*Gayophytum diffusum*  
*Gayophytum humile*  
*Gayophytum intermedium*  
*Gayophytum lasiospermum*  
*Gayophytum nuttallii*  
*Gayophytum pumilum*  
*Gayophytum racemosum*  
*Gayophytum ramosissimum*  
*Gentiana affinis*  
*Gentiana algida*  
*Gentiana andrewsii*  
*Gentiana aquatica*  
*Gentiana bisetacea*  
*Gentiana calycosa*  
*Gentiana douglasiana*  
*Gentiana glauca*  
*Gentiana newberryi*  
*Gentiana oregana*  
*Gentiana pleurisetosa*  
*Gentiana prostrata*  
*Gentiana puberulenta*  
*Gentiana saxicola*  
*Gentiana sceptrum*  
*Gentiana setigera*  
*Gentianella amarella*  
*Gentianella barbellata*  
*Gentianella detonsa*  
*Gentianella propinqua*  
*Gentianella tenella*  
*Gentianopsis macounii*  
*Gentianopsis procera*  
*Gentianopsis simplex*  
*Geocaulon lividum*  
*Geranium bicknellii*  
*Geranium caespitosum*  
*Geranium californicum*  
*Geranium carolinianum*  
*Geranium columbinum*  
*Geranium dissectum*  
*Geranium incisum*  
*Geranium maculatum*  
*Geranium molle*  
*Geranium oreganum*  
*Geranium pusillum*  
*Geranium richardsonii*  
*Geranium robertianum*  
*Geranium sanguineum*  
*Geranium viscosissimum*  
*Geum aleppicum*  
*Geum campanulatum*

*Geum canadense*  
*Geum ciliatum*  
*Geum macrophyllum*  
*Geum oregonense*  
*Geum rivale*  
*Geum rossii*  
*Geum triflorum*  
*Geum urbanum*  
*Gilia brecciarum*  
*Gilia breweri*  
*Gilia capillaris*  
*Gilia capitata*  
*Gilia ciliata*  
*Gilia filifolia*  
*Gilia inconspicua*  
*Gilia leptomeria*  
*Gilia nuttallii*  
*Gilia ophthalmoides*  
*Gilia polycladon*  
*Gilia pulchella*  
*Gilia tenerima*  
*Ginkgo biloba*  
*Githopsis calycina*  
*Githopsis specularioides*  
*Glaucium corniculatum*  
*Glaux maritima*  
*Glecoma hederacea*  
*Gleditsia triacanthos*  
*Glehnia leiocarpa*  
*Glehnia littoralis*  
*Glossopetalon nevadense*  
*Glossopetalon spinescens*  
*Glyceria borealis*  
*Glyceria elata*  
*Glyceria fluitans*  
*Glyceria grandis*  
*Glyceria occidentalis*  
*Glyceria pauciflora*  
*Glyceria striata*  
*Glycyrrhiza lepidota*  
*Glyptopleura marginata*  
*Gnaphalium californicum*  
*Gnaphalium chilense*  
*Gnaphalium collinum*  
*Gnaphalium japonicum*  
*Gnaphalium microcephalum*  
*Gnaphalium palustre*  
*Gnaphalium purpureum*  
*Gnaphalium uliginosum*  
*Gnaphalium viscosum*  
*Godetia caurina*  
*Godetia gracilis*  
*Godetia pacifica*  
*Godetia quadrivulnera*

*Godetia tenella*  
*Gomphocarpus cordifolius*  
*Goodyera decipiens*  
*Goodyera oblongifolia*  
*Goodyera repens*  
*Gratiola aurea*  
*Gratiola ebracteata*  
*Gratiola neglecta*  
*Grayia spinosa*  
*Greeneocharis circumscissa*  
*Grindelia columbiana*  
*Grindelia howellii*  
*Grindelia integrifolia*  
*Grindelia nana*  
*Grindelia squarrosa*  
*Gutierrezia sarothrae*  
*Gymnocarpium dryopteris*  
*Gymnocarpium robertianum*  
*Gymnocladus dioica*  
*Gymnosteris nudicaulis*  
*Gymnosteris parvula*  
*Gypsophila acutifolia*  
*Gypsophila muralis*  
*Gypsophila paniculata*  
*Habenaria chorisiana*  
*Habenaria clavellata*  
*Habenaria dilatata*  
*Habenaria elegans*  
*Habenaria greenei*  
*Habenaria hyperborea*  
*Habenaria leucophaea*  
*Habenaria leucostachys*  
*Habenaria maritima*  
*Habenaria obtusata*  
*Habenaria orbiculata*  
*Habenaria saccata*  
*Habenaria sparsiflora*  
*Habenaria stricta*  
*Habenaria unalascensis*  
*Habenaria viridis*  
*Hackelia arida*  
*Hackelia californica*  
*Hackelia ciliata*  
*Hackelia cinerea*  
*Hackelia cronquistii*  
*Hackelia cusickii*  
*Hackelia davisii*  
*Hackelia deflexa*  
*Hackelia diffusa*  
*Hackelia floribunda*  
*Hackelia hispida*  
*Hackelia jessicae*  
*Hackelia micrantha*  
*Hackelia nelsonii*

*Hackelia ophiobia*  
*Hackelia patens*  
*Hackelia setosa*  
*Hackelia venusta*  
*Hackelia virginiana*  
*Halenia deflexa*  
*Halimolobos perplexa*  
*Halimolobos virgata*  
*Halimolobos whitedii*  
*Halogeton glomeratus*  
*Halophila ballonis*  
*Halophila englemannii*  
*Halophila hawaiiiana*  
*Halophila johnsonii*  
*Hamosa paysonii*  
*Haplopappus aberrans*  
*Haplopappus acaulis*  
*Haplopappus arborescens*  
*Haplopappus armerioides*  
*Haplopappus bloomeri*  
*Haplopappus brandegei*  
*Haplopappus carthamoides*  
*Haplopappus contractus*  
*Haplopappus greenei*  
*Haplopappus hallii*  
*Haplopappus hirtus*  
*Haplopappus insecticuriis*  
*Haplopappus integrifolius*  
*Haplopappus lanceolatus*  
*Haplopappus lanuginosus*  
*Haplopappus latrifolius*  
*Haplopappus linearis*  
*Haplopappus lyallii*  
*Haplopappus macronema*  
*Haplopappus multicaulis*  
*Haplopappus nanus*  
*Haplopappus pygmaeus*  
*Haplopappus racemosus*  
*Haplopappus radiatus*  
*Haplopappus resinosus*  
*Haplopappus spinulosus*  
*Haplopappus stenophyllus*  
*Haplopappus suffruticosus*  
*Haplopappus uniflorus*  
*Hastingsia bracteosa*  
*Hedeoma drummondii*  
*Hedeoma hispida*  
*Hedera helix*  
*Hedyotis longifolia*  
*Hedysarum alpinum*  
*Hedysarum boreale*  
*Hedysarum occidentale*  
*Hedysarum sulphurescens*  
*Helenium autumnale*

*Helenium bigelovii*  
*Helenium bolanderi*  
*Helenium hoopesii*  
*Helenium puberulum*  
*Helianthella douglasii*  
*Helianthella quinquenervis*  
*Helianthella uniflora*  
*Helianthemum bicknellii*  
*Helianthus annuus*  
*Helianthus bolanderi*  
*Helianthus ciliaris*  
*Helianthus cusickii*  
*Helianthus grosseserratus*  
*Helianthus maximiliani*  
*Helianthus nuttallii*  
*Helianthus petiolaris*  
*Helianthus rigidus*  
*Helianthus tuberosus*  
*Helictotrichon hookeri*  
*Heliopsis helianthoides*  
*Heliotropium curassavicum*  
*Helleborus niger*  
*Hemerocallis fulva*  
*Hemicarpha drummondii*  
*Hemicarpha micrantha*  
*Hemicarpha occidentalis*  
*Hemitomes congestum*  
*Hemizonella minima*  
*Hemizonia clevelandii*  
*Hemizonia fitchii*  
*Hemizonia pungens*  
*Hepatica sp.*  
*Heracleum lanatum*  
*Heracleum mantegazzianum*  
*Herniaria cineria*  
*Hesperis matronalis*  
*Hesperochiron californicus*  
*Hesperochiron lasianthus*  
*Hesperochiron pumilus*  
*Heterocodon rariflorum*  
*Heterotheca oregana*  
*Heterotheca subaxillaris*  
*Heuchera chlorantha*  
*Heuchera cylindrica*  
*Heuchera glabella*  
*Heuchera glabra*  
*Heuchera grossulariifolia*  
*Heuchera micrantha*  
*Heuchera ovalifolia*  
*Heuchera parviflora*  
*Heuchera parvifolia*  
*Heuchera richardsonii*  
*Heuchera rubescens*  
*Heuchera utahensis*

*Hibiscus grandiflorus*  
*Hibiscus rosa-sinensis*  
*Hibiscus syriacus*  
*Hibiscus trionum*  
*Hieracium pratense*  
*Hieracium albertinum*  
*Hieracium albidiflorum*  
*Hieracium aurantiacum*  
*Hieracium bolanderi*  
*Hieracium canadense*  
*Hieracium chapcanum*  
*Hieracium cynoglossoides*  
*Hieracium floribundum*  
*Hieracium gracile*  
*Hieracium greenei*  
*Hieracium horridum*  
*Hieracium longiberbe*  
*Hieracium parryi*  
*Hieracium pilosella*  
*Hieracium piloselloides*  
*Hieracium pratense*  
*Hieracium rydbergii*  
*Hieracium scouleri*  
*Hieracium umbellatum*  
*Hieracium vulgatum*  
*Hierochloa alpina*  
*Hierochloa occidentalis*  
*Hierochloa odorata*  
*Hilaria jamesii*  
*Hippophae rhamnoides*  
*Hippuris montana*  
*Hippuris vulgaris*  
*Hoffmanseggia densiflora*  
*Holcus lanatus*  
*Holcus mollis*  
*Holodiscus discolor*  
*Holodiscus dumosus*  
*Holodiscus glabrescens*  
*Holosteum umbellatum*  
*Hordeum brachyantherum*  
*Hordeum bulbosum*  
*Hordeum californicum*  
*Hordeum depressum*  
*Hordeum distichon*  
*Hordeum geniculatum*  
*Hordeum glaucum*  
*Hordeum gussonianum*  
*Hordeum jubatum*  
*Hordeum leporinum*  
*Hordeum murinum*  
*Hordeum nodosum*  
*Hordeum pusillum*  
*Hordeum vulgare*  
*Horkelia capitata*

*Horkelia caruifolia*  
*Horkelia congesta*  
*Horkelia daucifolia*  
*Horkelia fusca*  
*Horkelia hendersonii*  
*Horkelia howellii*  
*Horkelia sericata*  
*Horkelia tenella*  
*Horkelia tridentata*  
*Hosackia denticulata*  
*Howellia aquatilis*  
*Hudsonia tomentosa*  
*Hulsea algida*  
*Hulsea nana*  
*Humulus lupulus*  
*Hutchinsia procumbens*  
*Hydrangea arborescens*  
*Hydrangea quercifolia*  
*Hydrilla verticillata*  
*Hydrilla verticillata*  
*Hydrocharis morsus-ranae*  
*Hydrocotyle ranunculoides*  
*Hydrocotyle umbellata*  
*Hydrocotyle verticillata*  
*Hydrophyllum capitatum*  
*Hydrophyllum fendleri*  
*Hydrophyllum occidentale*  
*Hydrophyllum tenuipes*  
*Hydrophyllum virginianum*  
*Hygrophila polysperma*  
*Hymenopappus filifolius*  
*Hymenopappus tenuifolius*  
*Hymenoxys acaulis*  
*Hymenoxys cooperi*  
*Hymenoxys grandiflora*  
*Hymenoxys jamesii*  
*Hymenoxys richardsonii*  
*Hymenoxys torreyana*  
*Hyoscyamus niger*  
*Hypericum anagaloides*  
*Hypericum androsaemum*  
*Hypericum concinnum*  
*Hypericum formosum*  
*Hypericum majus*  
*Hypericum mutilum*  
*Hypericum perforatum*  
*Hypochaeris radicata*  
*Hypopitys latissuama*  
*Hypopitys monotropa*  
*Hypopitys multiflora*  
*Hypoxis hirsuta*  
*Hysopus officinalis*  
*Hystrix patula*  
*Iberis amara*

*Iberis umbellata*  
*Idahoa scapigera*  
*Ilex aquifolium*  
*Iliamna latibracteata*  
*Iliamna longisepala*  
*Iliamna rivularis*  
*Impatiens aurella*  
*Impatiens balfouri*  
*Impatiens capensis*  
*Impatiens ecalcarata*  
*Impatiens glandulifera*  
*Impatiens noli-tangere*  
*Impatiens pallida*  
*Imperata brasiliensis*  
*Imperata cylindrica*  
*Inula helenium*  
*Ipomoea aquatica*  
*Ipomoea coccinea*  
*Ipomoea hirsutula*  
*Ipomoea leptophylla*  
*Ipomoea purpurea*  
*Ipomoea triloba*  
*Ipomopsis polycladon*  
*Ipomopsis aggregata*  
*Ipomopsis congesta*  
*Ipomopsis crebrifolia*  
*Ipomopsis minutiflora*  
*Ipomopsis orchidacea*  
*Ipomopsis pumila*  
*Ipomopsis spicata*  
*Ipomopsis tenuituba*  
*Iris bracteata*  
*Iris chrysophylla*  
*Iris douglasiana*  
*Iris hartwegii*  
*Iris innominata*  
*Iris macrosiphon*  
*Iris missouriensis*  
*Iris pseudacorus*  
*Iris tenax*  
*Iris tenuis*  
*Iris thompsoni*  
*Isatis tinctoria*  
*Ischaemum rugosum*  
*Isoetes bolanderi*  
*Isoetes echinospora*  
*Isoetes lacustris*  
*Isoetes melanopoda*  
*Isoetes nuttallii*  
*Isoetes occidentalis*  
*Isoetes setacea*  
*Isopyrum bitematum*  
*Isopyrum hallii*  
*Isopyrum stipitatum*

*Iva annua*  
*Iva axillaris*  
*Iva xanthifolia*  
*Ivesia baileyi*  
*Ivesia gordonii*  
*Ivesia kingii*  
*Ivesia rhypara*  
*Ivesia shelleyi*  
*Ivesia tweedyi*  
*Jamesia americana*  
*Jasione montana*  
*Jaumea carnosa*  
*Juglans ailanthifolia*  
*Juglans cinerea*  
*Juglans nigra*  
*Juncus abjectus*  
*Juncus acuminatus*  
*Juncus alpinus*  
*Juncus alpinus*  
*Juncus arcticus*  
*Juncus articulatus*  
*Juncus badius*  
*Juncus balticus*  
*Juncus biglumis*  
*Juncus bolanderi*  
*Juncus brachycephalus*  
*Juncus brachyphyllus*  
*Juncus brevicaudatus*  
*Juncus bufonius*  
*Juncus capillaris*  
*Juncus castaneus*  
*Juncus columbianus*  
*Juncus compressus*  
*Juncus confusus*  
*Juncus covillei*  
*Juncus drummondii*  
*Juncus dubius*  
*Juncus effusus*  
*Juncus ensifolius*  
*Juncus falcatus*  
*Juncus filiformis*  
*Juncus fucensis*  
*Juncus gerardii*  
*Juncus hallii*  
*Juncus hemiendytus*  
*Juncus howellii*  
*Juncus interior*  
*Juncus kelloggii*  
*Juncus lesueurii*  
*Juncus longistylis*  
*Juncus macranthus*  
*Juncus marginatus*  
*Juncus mertensianus*  
*Juncus nevadensis*

*Juncus nodosus*  
*Juncus oreganus*  
*Juncus orthophyllus*  
*Juncus oxymiris*  
*Juncus parryi*  
*Juncus patens*  
*Juncus phaeocephalus*  
*Juncus planifolius*  
*Juncus regelii*  
*Juncus supiniformis*  
*Juncus supinus*  
*Juncus tenuis*  
*Juncus tiehmii*  
*Juncus torreyi*  
*Juncus tracyi*  
*Juncus triglumis*  
*Juncus tweedyi*  
*Juncus uncialis*  
*Juncus vaseyi*  
*Juncus xiphioides*  
*Juniperus communis*  
*Juniperus horizontalis*  
*Juniperus occidentalis*  
*Juniperus osteosperma*  
*Juniperus scopulorum*  
*Juniperus virginiana*  
*Jussiaea repens*  
*Jussiaea uruguayensis*  
*Kalmia microphylla*  
*Kalmia occidentalis*  
*Kalmia polifolia*  
*Kalmiopsis leachiana*  
*Kelloggia galioides*  
*Kelseya uniflora*  
*Keria japonica*  
*Kickxia elatine*  
*Kickxia spuria*  
*Knautia arvensis*  
*Kobresia macrocarpa*  
*Kobresia myosuroides*  
*Kobresia simpliciuscula*  
*Kochia americana*  
*Kochia scoparia*  
*Koeleria cristata*  
*Koeleruteria paniculata*  
*Koenigia islandica*  
*Kolkwitzia amabilis*  
*Kuhnia eupatorioides*  
*Laburnum X watereri*  
*Laburnum anagyroides*  
*Lactuca biennis*  
*Lactuca canadensis*  
*Lactuca ludoviciana*  
*Lactuca muralis*

*Lactuca oblongifolia*  
*Lactuca saligna*  
*Lactuca sativa*  
*Lactuca serriola*  
*Lactuca spicata*  
*Lagarosiphon major*  
*Lagophylla ramossissima*  
*Lagurus ovatus*  
*Lallemantia peltata*  
*Lamium amplexicaule*  
*Lamium hybridum*  
*Lamium maculatum*  
*Lamium purpureum*  
*Langloisia setosissima*  
*Laportea canadensis*  
*Lappula cenchrusoides*  
*Lappula echinata*  
*Lappula occidentalis*  
*Lappula redowskii*  
*Lappula texana*  
*Lapsana communis*  
*Larix lyallii*  
*Larix occidentalis*  
*Lasthenia chrysostoma*  
*Lasthenia glaberrima*  
*Lasthenia macrantha*  
*Lasthenia minor*  
*Lathyrus americanus*  
*Lathyrus aphaca*  
*Lathyrus bijugatus*  
*Lathyrus cusickii*  
*Lathyrus delnorticus*  
*Lathyrus eucosmus*  
*Lathyrus grimesii*  
*Lathyrus hirsutus*  
*Lathyrus holochlorus*  
*Lathyrus japonicus*  
*Lathyrus lanceolatus*  
*Lathyrus lanszwertii*  
*Lathyrus latifolius*  
*Lathyrus littoralis*  
*Lathyrus nevadensis*  
*Lathyrus nuttallii*  
*Lathyrus obovatus*  
*Lathyrus ochroleucus*  
*Lathyrus odoratus*  
*Lathyrus oregonensis*  
*Lathyrus palustris*  
*Lathyrus pauciflorus*  
*Lathyrus polymorphus*  
*Lathyrus polyphyllus*  
*Lathyrus pratensis*  
*Lathyrus rigidus*  
*Lathyrus schaffneri*

*Lathyrus sphaericus*  
*Lathyrus sulphureus*  
*Lathyrus sylvestris*  
*Lathyrus torreyi*  
*Lathyrus tuberosus*  
*Lathyrus venosus*  
*Lathyrus vestitus*  
*Lavatera arborea*  
*Layia glandulosa*  
*Lechea intermedia*  
*Lechea stricta*  
*Ledum glandulosum*  
*Ledum groenlandicum*  
*Leersia oryzoides*  
*Leersia virginica*  
*Lemna gibba*  
*Lemna minor*  
*Lemna perpusilla*  
*Lemna trisulca*  
*Lemna turionifera*  
*Lemna valdiviana*  
*Leontodon autumnalis*  
*Leontodon nudicaulis*  
*Leonurus cardiaca*  
*Lepidium campestre*  
*Lepidium davissi*  
*Lepidium densiflorum*  
*Lepidium dictyotum*  
*Lepidium draba*  
*Lepidium lasiocarpum*  
*Lepidium latifolium*  
*Lepidium medium*  
*Lepidium montanum*  
*Lepidium nanum*  
*Lepidium nitidum*  
*Lepidium oxycarpum*  
*Lepidium papilliferum*  
*Lepidium perfoliatum*  
*Lepidium ramosissimum*  
*Lepidium repens*  
*Lepidium rudemale*  
*Lepidium sativum*  
*Lepidium strictum*  
*Lepidium virginicum*  
*Leptarrhena amplexifolia*  
*Leptarrhena pyrolifolia*  
*Leptaxis menziesii*  
*Leptochloa chinensis*  
*Leptochloa fascicularis*  
*Leptochloa uninervia*  
*Leptodactylon caespitosum*  
*Leptodactylon glabrum*  
*Leptodactylon hazelae*  
*Leptodactylon pungens*

*Leptodactylon watsonii*  
*Leptotaenia dissecta*  
*Leptotaenia multifida*  
*Leptotaenia purpurea*  
*Lepyrodiclis holosteoides*  
*Lesquerella alpina*  
*Lesquerella argentea*  
*Lesquerella carinata*  
*Lesquerella douglasii*  
*Lesquerella fremontii*  
*Lesquerella humilis*  
*Lesquerella kingii*  
*Lesquerella klausii*  
*Lesquerella ludoviciana*  
*Lesquerella macrocarpa*  
*Lesquerella montana*  
*Lesquerella multiceps*  
*Lesquerella occidentalis*  
*Lesquerella paysonii*  
*Leucocorinum montanum*  
*Leucopoa kingii*  
*Leucothoe davisiae*  
*Lewisia columbiana*  
*Lewisia cotyledon*  
*Lewisia kelloggii*  
*Lewisia leana*  
*Lewisia oppositifolia*  
*Lewisia pygmaea*  
*Lewisia rediviva*  
*Lewisia triphylla*  
*Lewisia tweedyi*  
*Leymus salinus*  
*Liatris aspera*  
*Liatris ligulistylis*  
*Liatris punctata*  
*Liatris pycnostachya*  
*Libocedrus decurrens*  
*Ligusticum apiifolium*  
*Ligusticum californicum*  
*Ligusticum canbyi*  
*Ligusticum cusickii*  
*Ligusticum filicinum*  
*Ligusticum grayi*  
*Ligusticum porteri*  
*Ligusticum purpureum*  
*Ligusticum tenuifolium*  
*Ligusticum verticillatum*  
*Ligustrum amurense*  
*Ligustrum indicum*  
*Ligustrum japonicum*  
*Ligustrum sinense*  
*Ligustrum vulgare*  
*Lilaea scilloides*  
*Lilaeopsis occidentalis*

*Lilium bolanderi*  
*Lilium canadense*  
*Lilium columbianum*  
*Lilium kelleyanum*  
*Lilium kelloggii*  
*Lilium occidentale*  
*Lilium pardalinum*  
*Lilium parvum*  
*Lilium philadelphicum*  
*Lilium pudica*  
*Lilium rubescens*  
*Lilium vollmeri*  
*Lilium washingtonianum*  
*Lilium wigginsii*  
*Limnanthes alba*  
*Limnanthes douglasii*  
*Limnanthes gracilis*  
*Limnanthes rosea*  
*Limnobia laevigatum*  
*Limnobia spongia*  
*Limnophila sessiliflora*  
*Limnosella acaulis*  
*Limosella aquatica*  
*Linanthus androsaceus*  
*Linanthus bakeri*  
*Linanthus bicolor*  
*Linanthus bolanderi*  
*Linanthus ciliatus*  
*Linanthus grandiflorus*  
*Linanthus harknessii*  
*Linanthus liniflorus*  
*Linanthus nuttallii*  
*Linanthus pharmaceoides*  
*Linanthus septentrionalis*  
*Linaria canadensis*  
*Linaria dalmatica*  
*Linaria vulgaris*  
*Lindernia dubia*  
*Linnaea borealis*  
*Linum australe*  
*Linum bienne*  
*Linum digynum*  
*Linum kingii*  
*Linum micranthum*  
*Linum perenne*  
*Linum rigidum*  
*Linum sulcatum*  
*Linum usitatissimum*  
*Liparis loeselii*  
*Lippia cuneifolia*  
*Liquidambar styraciflua*  
*Liriodendron tulipifera*  
*Listera borealis*  
*Listera caurina*

*Listera convallarioides*  
*Listera cordata*  
*Lithocarpus densiflorus*  
*Lithophragma affinis*  
*Lithophragma campanulata*  
*Lithophragma glabra*  
*Lithophragma heterophylla*  
*Lithophragma parviflora*  
*Lithophragma tenellum*  
*Lithospermum arvense*  
*Lithospermum californicum*  
*Lithospermum canescens*  
*Lithospermum incisum*  
*Lithospermum ruderales*  
*Lloydia serotina*  
*Lobelia dortmanna*  
*Lobelia kalmii*  
*Lobelia siphilitica*  
*Lobelia spicata*  
*Lobularia maritima*  
*Loiseleuria procumbens*  
*Lolium multiflorum*  
*Lolium perenne*  
*Lolium persicum*  
*Lolium remotum*  
*Lolium temulentum*  
*Lomatium ambiguum*  
*Lomatium angustatum*  
*Lomatium attenuatum*  
*Lomatium bicolor*  
*Lomatium bradshawii*  
*Lomatium brandegei*  
*Lomatium californicum*  
*Lomatium canbyi*  
*Lomatium circumdatum*  
*Lomatium columbianum*  
*Lomatium cookii*  
*Lomatium cous*  
*Lomatium cusickii*  
*Lomatium cuspidatum*  
*Lomatium dissectum*  
*Lomatium donnellii*  
*Lomatium engelmannii*  
*Lomatium erythrocarpum*  
*Lomatium farinosum*  
*Lomatium foeniculaceum*  
*Lomatium geyeri*  
*Lomatium gormanii*  
*Lomatium graveolens*  
*Lomatium grayi*  
*Lomatium greenmanii*  
*Lomatium hallii*  
*Lomatium hamblenae*  
*Lomatium hendersonii*

*Lomatium howellii*  
*Lomatium idahoense*  
*Lomatium juniperium*  
*Lomatium laevigatum*  
*Lomatium leptocarpum*  
*Lomatium macrocarpum*  
*Lomatium martinalei*  
*Lomatium minus*  
*Lomatium nelsonianum*  
*Lomatium nevadense*  
*Lomatium nudicaule*  
*Lomatium nuttallii*  
*Lomatium oreganum*  
*Lomatium orientale*  
*Lomatium pastoralis*  
*Lomatium peckianum*  
*Lomatium ravenii*  
*Lomatium rollinsii*  
*Lomatium salmoniflorum*  
*Lomatium sandbergii*  
*Lomatium scabrum*  
*Lomatium serpentinum*  
*Lomatium suksdorfii*  
*Lomatium thompsonii*  
*Lomatium tracyi*  
*Lomatium triternatum*  
*Lomatium tuberosum*  
*Lomatium utriculatum*  
*Lomatium vaginatum*  
*Lomatium watsonii*  
*Lomatogonium rotatum*  
*Lonicera X bella*  
*Lonicera caerulea*  
*Lonicera cauriana*  
*Lonicera ciliosa*  
*Lonicera conjugialis*  
*Lonicera dioica*  
*Lonicera etrusca*  
*Lonicera hispida*  
*Lonicera interrupta*  
*Lonicera involucreta*  
*Lonicera nitida*  
*Lonicera periclymenum*  
*Lonicera tartarica*  
*Lonicera tatarica*  
*Lonicera utahensis*  
*Lonicera villosa*  
*Lophotocarpus californicus*  
*Lotus aboriginum*  
*Lotus americanus*  
*Lotus bicolor*  
*Lotus corniculatus*  
*Lotus crassifolius*  
*Lotus denticulatus*

*Lotus douglasii*  
*Lotus formosissimus*  
*Lotus micranthus*  
*Lotus nevadensis*  
*Lotus oblongifolius*  
*Lotus pedunculatus*  
*Lotus pinnatus*  
*Lotus purshiana*  
*Lotus stipularis*  
*Lotus subpinnatus*  
*Lotus tetragonolobus*  
*Ludwigia palustris*  
*Ludwigia polycarpa*  
*Luetkea pectinata*  
*Luina hypoleuca*  
*Luina nardosmia*  
*Luina serpentina*  
*Luina stricta*  
*Lunaria annua*  
*Lupinus X alpestris*  
*Lupinus adsurgens*  
*Lupinus affinis*  
*Lupinus albicaulis*  
*Lupinus albilfrons*  
*Lupinus alpestris*  
*Lupinus andersonii*  
*Lupinus arboreus*  
*Lupinus argenteus*  
*Lupinus bicolor*  
*Lupinus biddlei*  
*Lupinus brevicaulis*  
*Lupinus brewerii*  
*Lupinus caudatus*  
*Lupinus corymbosus*  
*Lupinus cusickii*  
*Lupinus formosus*  
*Lupinus holosericeus*  
*Lupinus lapidicola*  
*Lupinus latifolius*  
*Lupinus laxiflorus*  
*Lupinus lepidus*  
*Lupinus leucophyllus*  
*Lupinus littoralis*  
*Lupinus luteolus*  
*Lupinus micranthus*  
*Lupinus microcarpus*  
*Lupinus mucronulatus*  
*Lupinus nanus*  
*Lupinus onustus*  
*Lupinus ornatus*  
*Lupinus plattensis*  
*Lupinus polyphyllus*  
*Lupinus pseudoparviflorus*  
*Lupinus pusillus*

*Lupinus rivularis*  
*Lupinus sabinii*  
*Lupinus saxosus*  
*Lupinus scheuberae*  
*Lupinus sericeus*  
*Lupinus subalpinus*  
*Lupinus subvexus*  
*Lupinus suksdorfii*  
*Lupinus sulphureus*  
*Lupinus superbus*  
*Lupinus tracyi*  
*Lupinus uncialis*  
*Lupinus wyethii*  
*Luzula arcuata*  
*Luzula campestris*  
*Luzula comosa*  
*Luzula divaricata*  
*Luzula hitchcockii*  
*Luzula parviflora*  
*Luzula piperi*  
*Luzula spicata*  
*Luzula subsessilis*  
*Lychnis X arkwrightii*  
*Lychnis alba*  
*Lychnis apetala*  
*Lychnis chalcidonica*  
*Lychnis coronaria*  
*Lychnis dioica*  
*Lychnis drummondii*  
*Lychnis flos-cuculi*  
*Lycium ferocissimum*  
*Lycium halimifolium*  
*Lycopersicon lycopersicum*  
*Lycopodium alpinum*  
*Lycopodium annotinum*  
*Lycopodium clavatum*  
*Lycopodium complanatum*  
*Lycopodium inundatum*  
*Lycopodium obscurum*  
*Lycopodium selago*  
*Lycopodium sitchense*  
*Lycopus americanus*  
*Lycopus asper*  
*Lycopus uniflorus*  
*Lygodesmia grandiflora*  
*Lygodesmia juncea*  
*Lygodesmia spinosa*  
*Lysichitum americanum*  
*Lysimachia ciliata*  
*Lysimachia clethroides*  
*Lysimachia hybrida*  
*Lysimachia lanceolata*  
*Lysimachia nummularia*  
*Lysimachia punctata*

*Lysimachia quadriflora*  
*Lysimachia terrestris*  
*Lysimachia thyrsoflora*  
*Lysimachia verticillata*  
*Lysimachia vulgaris*  
*Lythrum alatum*  
*Lythrum hyssopifolia*  
*Lythrum salicaria*  
*Lythrum virgatum*  
*Machaeranthera bigelovii*  
*Machaeranthera canescens*  
*Machaeranthera commixta*  
*Machaeranthera grindelioides*  
*Machaeranthera laetevirens*  
*Machaeranthera linearis*  
*Machaeranthera shastensis*  
*Machaeranthera tanacetifolia*  
*Machaerocarpus californicus*  
*Maclura pomifera*  
*Madia bolanderi*  
*Madia citradora*  
*Madia dissitiflora*  
*Madia elegans*  
*Madia exigua*  
*Madia glomerata*  
*Madia gracilis*  
*Madia madioides*  
*Madia minima*  
*Madia sativa*  
*Mahonia nervosa*  
*Mahonia pumila*  
*Maianthemum canadense*  
*Maianthemum dilatatum*  
*Maianthemum racemosum*  
*Maianthemum stellatum*  
*Malacothrix californica*  
*Malacothrix glabrata*  
*Malacothrix torreyi*  
*Malcolmia africana*  
*Malus diversifolia*  
*Malus floribunda*  
*Malus fusca*  
*Malva moschata*  
*Malva neglecta*  
*Malva parviflora*  
*Malva rotundifolia*  
*Malva sylvestris*  
*Malva verticillata*  
*Marah oreganus*  
*Mariana lactea*  
*Marrubium vulgare*  
*Marsilea vestita*  
*Martynia louisiana*  
*Matricaria chamomilla*

*Matricaria discoidea*  
*Matricaria maritima*  
*Matricaria matricarioides*  
*Matteuccia struthiopteris*  
*Mazus japonicus*  
*Meconella californica*  
*Meconella oregana*  
*Medicago arabica*  
*Medicago falcata*  
*Medicago hispida*  
*Medicago lupulina*  
*Medicago sativa*  
*Medicago arabica*  
*Megarrhiza oregana*  
*Melampyrum lineare*  
*Melica aristata*  
*Melica bulbosa*  
*Melica californica*  
*Melica fugax*  
*Melica geyeri*  
*Melica harfordii*  
*Melica imperfecta*  
*Melica smithii*  
*Melica spectabilis*  
*Melica striata*  
*Melica stricta*  
*Melica subulata*  
*Melilotus alba*  
*Melilotus indica*  
*Melilotus officinalis*  
*Melissa officinalis*  
*Menispermum canadense*  
*Mentha X piperita*  
*Mentha alopecuroides*  
*Mentha arvensis*  
*Mentha citrata*  
*Mentha pulegium*  
*Mentha spicata*  
*Mentha suaveolens*  
*Mentzelia acuminata*  
*Mentzelia albicaulis*  
*Mentzelia congesta*  
*Mentzelia decapetala*  
*Mentzelia dispersa*  
*Mentzelia laevicaulis*  
*Mentzelia mollis*  
*Mentzelia montana*  
*Mentzelia nuda*  
*Mentzelia oligosperma*  
*Mentzelia packardiae*  
*Mentzelia pumila*  
*Mentzelia torreyi*  
*Mentzelia veatchiana*  
*Menyanthes trifoliata*

*Menziesia ferruginea*  
*Merimea texana*  
*Mertensia alpina*  
*Mertensia arizonica*  
*Mertensia bella*  
*Mertensia brevistyla*  
*Mertensia campanulata*  
*Mertensia ciliata*  
*Mertensia cusickii*  
*Mertensia franciscana*  
*Mertensia fusiformis*  
*Mertensia lanceolata*  
*Mertensia longiflora*  
*Mertensia oblongifolia*  
*Mertensia paniculata*  
*Mertensia perplexa*  
*Mertensia platyphylla*  
*Mertensia umbratilis*  
*Mesembryanthemum*  
*aequilaterale*  
*Mesembryanthemum chilense*  
*Microcala quadrangularis*  
*Micromeria chamissonis*  
*Micromeria douglasii*  
*Micropus californicus*  
*Microseris acuminata*  
*Microseris alpestris*  
*Microseris bigelovii*  
*Microseris borealis*  
*Microseris cuspidata*  
*Microseris detlingii*  
*Microseris douglasii*  
*Microseris howellii*  
*Microseris laciniata*  
*Microseris lindleyi*  
*Microseris linearifolia*  
*Microseris nigrescens*  
*Microseris nutans*  
*Microseris troximoides*  
*Microsteris gracilis*  
*Microsteris humilis*  
*Microsteris micrantha*  
*Mikania cordata*  
*Mikania micrantha*  
*Milium vernale*  
*Mimetanthe pilosa*  
*Mimosa invisa*  
*Mimosa pigra*  
*Mimulus alsinoides*  
*Mimulus aurantiacus*  
*Mimulus breviflorus*  
*Mimulus breweri*  
*Mimulus cardinalis*  
*Mimulus clivicola*

*Mimulus cusickii*  
*Mimulus dentatus*  
*Mimulus douglasii*  
*Mimulus floribundus*  
*Mimulus glabratus*  
*Mimulus guttatus*  
*Mimulus hymenophyllus*  
*Mimulus implexus*  
*Mimulus jepsonii*  
*Mimulus jungermannioides*  
*Mimulus kelloggii*  
*Mimulus lewisii*  
*Mimulus microphyllus*  
*Mimulus moschatus*  
*Mimulus nanus*  
*Mimulus nasutus*  
*Mimulus patulus*  
*Mimulus primuloides*  
*Mimulus pulsiferae*  
*Mimulus pygmaeus*  
*Mimulus ringens*  
*Mimulus scouleri*  
*Mimulus suksdorfii*  
*Mimulus tilingii*  
*Mimulus tricolor*  
*Mimulus washingtonensis*  
*Minuartia cismontana*  
*Minuartia howellii*  
*Minuartia macrantha*  
*Minulus kelloggii*  
*Mirabilis alba*  
*Mirabilis bigelovii*  
*Mirabilis greenei*  
*Mirabilis hirsuta*  
*Mirabilis jalapa*  
*Mirabilis linearis*  
*Mirabilis macfarlanei*  
*Mirabilis nyctaginea*  
*Mitella breweri*  
*Mitella caulescens*  
*Mitella diversifolia*  
*Mitella nuda*  
*Mitella ovalis*  
*Mitella pentandra*  
*Mitella stauropetala*  
*Mitella stenopetala*  
*Mitella trifida*  
*Mollugo verticillata*  
*Moluccella laevis*  
*Monarda didyma*  
*Monarda fistulosa*  
*Monardella discolor*  
*Monardella nervosa*  
*Monardella odoratissima*

*Monardella purpurea*  
*Monardella sheltoni*  
*Monardella villosa*  
*Monochoria hastata*  
*Monochoria vaginalis*  
*Monolepis nuttalliana*  
*Monolepis spilla*  
*Monolepis spathulata*  
*Monotropa hypopitys*  
*Monotropa uniflora*  
*Montia arenicola*  
*Montia chamissoi*  
*Montia cordifolia*  
*Montia dichotoma*  
*Montia diffusa*  
*Montia fontana*  
*Montia howellii*  
*Montia linearis*  
*Montia parvifolia*  
*Montia perfoliata*  
*Montia rubra*  
*Montia saxosa*  
*Montia sibirica*  
*Montia spathulata*  
*Morus alba*  
*Morus rubra*  
*Muhlenbergia andina*  
*Muhlenbergia asperifolia*  
*Muhlenbergia cuspidata*  
*Muhlenbergia filiformis*  
*Muhlenbergia frondosa*  
*Muhlenbergia glomerata*  
*Muhlenbergia jonesii*  
*Muhlenbergia mexicana*  
*Muhlenbergia microsperma*  
*Muhlenbergia minutissima*  
*Muhlenbergia racemosa*  
*Muhlenbergia richardsonii*  
*Muhlenbergia squarrosa*  
*Munroa squarrosa*  
*Muscari comosum*  
*Musineon divaricatum*  
*Musineon lineare*  
*Musineon tenuifolium*  
*Musineon vaginatum*  
*Myosotis arvensis*  
*Myosotis discolor*  
*Myosotis laxa*  
*Myosotis micrantha*  
*Myosotis scorpioides*  
*Myosotis sylvatica*  
*Myosotis verna*  
*Myosotis versicolor*  
*Myosurus apetalus*

*Myosurus aristatus*  
*Myosurus minimus*  
*Myosurus sessilis*  
*Myrica californica*  
*Myrica gale*  
*Myriophyllum brasiliense*  
*Myriophyllum elatinoideis*  
*Myriophyllum heterophyllum*  
*Myriophyllum hippuroides*  
*Myriophyllum pinnatum*  
*Myriophyllum sibiricum*  
*Myriophyllum spicatum*  
*Myrrhis odorata*  
*Najas flexilis*  
*Najas guadalupensis*  
*Najas marina*  
*Nama aretioides*  
*Nama densum*  
*Nama lobbii*  
*Nardus stricta*  
*Narthecium californicum*  
*Nassella trichotoma*  
*Nasturtium officinale*  
*Navarretia breweri*  
*Navarretia divaricata*  
*Navarretia heterandra*  
*Navarretia intertexta*  
*Navarretia Klickitatensis*  
*Navarretia leucocephala*  
*Navarretia minima*  
*Navarretia squarrosa*  
*Navarretia tagetina*  
*Nemacladus capillaris*  
*Nemacladus rigidus*  
*Nemophila breviflora*  
*Nemophila densa*  
*Nemophila heterophylla*  
*Nemophila inconspicua*  
*Nemophila kirtleyi*  
*Nemophila menziesii*  
*Nemophila parviflora*  
*Nemophila pedunculata*  
*Nemophila sepulta*  
*Nepeta X faassenii*  
*Nepeta cataria*  
*Nephrophyllidium crista-galli*  
*Neslia paniculata*  
*Nicandra physalodes*  
*Nicotiana acuminata*  
*Nicotiana attenuata*  
*Nicotiana bigelovii*  
*Nicotiana glauca*  
*Nigella damascena*  
*Nitrophila occidentalis*

*Nitrophylla occidentalis*  
*Nothocalais alpestris*  
*Nothochelone nemorosa*  
*Nuphar luteum*  
*Nuphar polysepala*  
*Nymphaea odorata*  
*Nymphaea polysepala*  
*Nymphaea tetragona*  
*Odontites verna*  
*Oemleria cerasiformis*  
*Oenanthe californica*  
*Oenanthe sarmentosa*  
*Oenothera albicaulis*  
*Oenothera alyssoides*  
*Oenothera andina*  
*Oenothera biennis*  
*Oenothera boothii*  
*Oenothera brachycarpa*  
*Oenothera breviflora*  
*Oenothera caespitosa*  
*Oenothera cheiranthifolia*  
*Oenothera claviformis*  
*Oenothera contorta*  
*Oenothera coronopifolia*  
*Oenothera deltoides*  
*Oenothera elata*  
*Oenothera erythrosepala*  
*Oenothera flava*  
*Oenothera heterantha*  
*Oenothera hilgardii*  
*Oenothera laciniata*  
*Oenothera lindleyi*  
*Oenothera macrocarpa*  
*Oenothera minor*  
*Oenothera nuttallii*  
*Oenothera pallida*  
*Oenothera palmeri*  
*Oenothera perennis*  
*Oenothera pilosella*  
*Oenothera psammophila*  
*Oenothera pubens*  
*Oenothera pygmaea*  
*Oenothera rhombipetala*  
*Oenothera rydbergii*  
*Oenothera scapoidea*  
*Oenothera subacaulis*  
*Oenothera tanacetifolia*  
*Oenothera villosa*  
*Oenothera wolffii*  
*Onobrychis viciaefolia*  
*Onoclea sensibilis*  
*Ononis repens*  
*Onopordum acanthium*  
*Onosmodium molle*

*Ophioglossum vulgatum*  
*Opopanax horridum*  
*Opuntia aurantiaca*  
*Opuntia crinacea*  
*Opuntia fragilis*  
*Opuntia humifusa*  
*Opuntia hystricina*  
*Opuntia macrorhiza*  
*Opuntia polyantha*  
*Opuntia rhodantha*  
*Orchis rotundifolia*  
*Orcuttia tenuis*  
*Origanum majoana*  
*Origanum vulgare*  
*Ornithogalum caudatum*  
*Ornithogalum umbellatum*  
*Orobanche californica*  
*Orobanche corymbosa*  
*Orobanche fasciculata*  
*Orobanche grayana*  
*Orobanche ludoviciana*  
*Orobanche minor*  
*Orobanche multiflora*  
*Orobanche pinorum*  
*Orobanche uniflora*  
*Orogenia fusiformis*  
*Orogenia linearifolia*  
*Orthocarpus attenuatus*  
*Orthocarpus barbatus*  
*Orthocarpus bracteatus*  
*Orthocarpus castillejoideus*  
*Orthocarpus copelandii*  
*Orthocarpus cryptanthus*  
*Orthocarpus cuspidatus*  
*Orthocarpus erianthus*  
*Orthocarpus faucibarbatus*  
*Orthocarpus hispidus*  
*Orthocarpus imbricatus*  
*Orthocarpus lacerus*  
*Orthocarpus lithospermoides*  
*Orthocarpus luteus*  
*Orthocarpus pusillus*  
*Orthocarpus tenuifolius*  
*Orthocarpus tolmiei*  
*Oryza longistaminata*  
*Oryza punctata*  
*Oryza rufipogon*  
*Oryzopsis asperifolia*  
*Oryzopsis contracta*  
*Oryzopsis exigua*  
*Oryzopsis hendersonii*  
*Oryzopsis hymenoides*  
*Oryzopsis pungens*  
*Oryzopsis racemosa*

*Oryzopsis swallenii*  
*Oryzopsis webberi*  
*Osmaonia cerasiformis*  
*Osmorhiza brevipetes*  
*Osmorhiza chilensis*  
*Osmorhiza claytonii*  
*Osmorhiza depauperata*  
*Osmorhiza divaricata*  
*Osmorhiza longistylis*  
*Osmorhiza nuda*  
*Osmorhiza occidentalis*  
*Osmorhiza purpurea*  
*Ostrya virginiana*  
*Ottelia alismoides*  
*Oxalis corniculata*  
*Oxalis dillenii*  
*Oxalis oregana*  
*Oxalis rubra*  
*Oxalis stricta*  
*Oxalis suksdorfii*  
*Oxalis trillifolia*  
*Oxalis violacea*  
*Oxyopsis occidentalis*  
*Oxyria digyna*  
*Oxytheca dendroidea*  
*Oxytheca dendroides*  
*Oxytropis besseyi*  
*Oxytropis borealis*  
*Oxytropis campestris*  
*Oxytropis deflexa*  
*Oxytropis lagopus*  
*Oxytropis lambertii*  
*Oxytropis luteola*  
*Oxytropis oreophila*  
*Oxytropis parryi*  
*Oxytropis podocarpa*  
*Oxytropis riparia*  
*Oxytropis sericea*  
*Oxytropis splendens*  
*Oxytropis viscida*  
*Pachistima myrsinites*  
*Paeonia brownii*  
*Panax quinquefolium*  
*Panicum capillare*  
*Panicum dichotomiflorum*  
*Panicum flexile*  
*Panicum leibergii*  
*Panicum linearifolium*  
*Panicum miliaceum*  
*Panicum occidentale*  
*Panicum pacificum*  
*Panicum praeocius*  
*Panicum scribnerianum*  
*Panicum thermale*

*Panicum virgatum*  
*Panicum wilcoxianum*  
*Papaver argemone*  
*Papaver kluanense*  
*Papaver pygmaeum*  
*Papaver rhoeas*  
*Papaver somniferum*  
*Parapholis incurva*  
*Parentucellia viscosa*  
*Parietaria pensylvanica*  
*Parnassia californica*  
*Parnassia fimbriata*  
*Parnassia glauca*  
*Parnassia kotzebuei*  
*Parnassia palustris*  
*Parnassia parviflora*  
*Paronychia depressa*  
*Paronychia pulvinata*  
*Paronychia sessiliflora*  
*Parrya nudicaulis*  
*Parthenium alpinum*  
*Parthenium ligulatum*  
*Parthenocissus quinquefolia*  
*Parthenocissus vitacea*  
*Paspalum dilatatum*  
*Paspalum distichum*  
*Paspalum scrobiculatum*  
*Pastinaca sativa*  
*Paulownia tomentosa*  
*Pectocarya linearis*  
*Pectocarya pusilla*  
*Pectocarya setosa*  
*Pedicularis atrosanguinea*  
*Pedicularis attollens*  
*Pedicularis bracteosa*  
*Pedicularis canadensis*  
*Pedicularis capitata*  
*Pedicularis centranthera*  
*Pedicularis contorta*  
*Pedicularis crenulata*  
*Pedicularis cystopteridifolia*  
*Pedicularis densiflora*  
*Pedicularis flavida*  
*Pedicularis groenlandica*  
*Pedicularis howellii*  
*Pedicularis lanceolata*  
*Pedicularis langsдорffii*  
*Pedicularis oederi*  
*Pedicularis ornithorhyncha*  
*Pedicularis parryi*  
*Pedicularis procera*  
*Pedicularis pulchella*  
*Pedicularis racemosa*  
*Pedicularis rainierensis*

*Pediocactus simpsonii*  
*Peganum harmala*  
*Pellaea andromedaefolia*  
*Pellaea atropurpurea*  
*Pellaea brachyptera*  
*Pellaea breweri*  
*Pellaea bridgesii*  
*Pellaea glabella*  
*Peltiphyllum peltatum*  
*Pennisetum clandestinum*  
*Pennisetum glaucum*  
*Pennisetum macrourum*  
*Pennisetum pedicellatum*  
*Pennisetum polystachion*  
*Pennisetum setaceum*  
*Penstemon X parishii*  
*Penstemon acaulis*  
*Penstemon acuminatus*  
*Penstemon albertinus*  
*Penstemon albidus*  
*Penstemon anguineus*  
*Penstemon angustifolius*  
*Penstemon arenicola*  
*Penstemon aridus*  
*Penstemon attenuatus*  
*Penstemon azureus*  
*Penstemon barrettiae*  
*Penstemon brevifolius*  
*Penstemon caeminis*  
*Penstemon caespitosus*  
*Penstemon cardwellii*  
*Penstemon caryi*  
*Penstemon chionophilus*  
*Penstemon cinicola*  
*Penstemon confertus*  
*Penstemon cusickii*  
*Penstemon cyananthus*  
*Penstemon cyaneus*  
*Penstemon davidsonii*  
*Penstemon deustus*  
*Penstemon diphyllus*  
*Penstemon dolius*  
*Penstemon elegantulus*  
*Penstemon ellipticus*  
*Penstemon eriantherus*  
*Penstemon euglaucus*  
*Penstemon flavesceus*  
*Penstemon fruticosus*  
*Penstemon gairdneri*  
*Penstemon gibbensii*  
*Penstemon glaber*  
*Penstemon glandulosus*  
*Penstemon glaucinus*  
*Penstemon globosus*

*Penstemon gracilentus*  
*Penstemon gracilis*  
*Penstemon grandiflorus*  
*Penstemon heterophyllus*  
*Penstemon humilis*  
*Penstemon idahoensis*  
*Penstemon janishiae*  
*Penstemon kingii*  
*Penstemon laetus*  
*Penstemon laricifolius*  
*Penstemon laxus*  
*Penstemon lemhiensis*  
*Penstemon lemmonii*  
*Penstemon leonardii*  
*Penstemon lineolatus*  
*Penstemon lyallii*  
*Penstemon menziesii*  
*Penstemon micranthus*  
*Penstemon miser*  
*Penstemon montanus*  
*Penstemon nemorosus*  
*Penstemon newberryi*  
*Penstemon nitidus*  
*Penstemon oreganus*  
*Penstemon oreocharis*  
*Penstemon ovatus*  
*Penstemon palmeri*  
*Penstemon parvulus*  
*Penstemon payettensis*  
*Penstemon paysoniorum*  
*Penstemon peckii*  
*Penstemon pennellianus*  
*Penstemon perpulcher*  
*Penstemon pratensis*  
*Penstemon procerus*  
*Penstemon pruinosis*  
*Penstemon pseudoprocerus*  
*Penstemon pumilus*  
*Penstemon purpusii*  
*Penstemon radicosus*  
*Penstemon rattani*  
*Penstemon richardsonii*  
*Penstemon roezlii*  
*Penstemon rupicola*  
*Penstemon rydbergii*  
*Penstemon scouleri*  
*Penstemon seorsus*  
*Penstemon serrulatus*  
*Penstemon spathulatus*  
*Penstemon spatulatus*  
*Penstemon speciosus*  
*Penstemon strictus*  
*Penstemon subglaber*  
*Penstemon subserratus*

*Penstemon tolmiei*  
*Penstemon triphyllus*  
*Penstemon variabilis*  
*Penstemon venustus*  
*Penstemon virens*  
*Penstemon washingtonensis*  
*Penstemon watsonii*  
*Penstemon whippleanus*  
*Penstemon wilcoxii*  
*Penthorum sedoides*  
*Peraphyllum ramosissimum*  
*Perideridia bolanderi*  
*Perideridia erythrorhiza*  
*Perideridia gairdneri*  
*Perideridia howellii*  
*Perideridia kelloggii*  
*Perideridia lemmonii*  
*Perideridia leptocarpa*  
*Perideridia oregana*  
*Perideridia parishii*  
*Perityle stansburii*  
*Pernettya mucronata*  
*Petalostemon ornatum*  
*Petasites frigidus*  
*Petasites japonicus*  
*Petasites nivalis*  
*Petasites palmatus*  
*Petasites sagittatus*  
*Petasites speciosa*  
*Peteria thompsoniae*  
*Petradoria pumila*  
*Petrohagia prolifera*  
*Petrohagia saxifraga*  
*Petrophytum caespitosum*  
*Petrophytum cinerascens*  
*Petrophytum hendersonii*  
*Petroselinum crispum*  
*Phaca salsula*  
*Phacelia affinis*  
*Phacelia alpina*  
*Phacelia aramosissima*  
*Phacelia argentea*  
*Phacelia bicolor*  
*Phacelia bolanderi*  
*Phacelia capitata*  
*Phacelia corymbosa*  
*Phacelia crenulata*  
*Phacelia franklinii*  
*Phacelia fremontii*  
*Phacelia frigida*  
*Phacelia glandulosa*  
*Phacelia hastata*  
*Phacelia heterophylla*  
*Phacelia humilis*

*Phacelia idahoensis*  
*Phacelia incana*  
*Phacelia inconspicua*  
*Phacelia inundata*  
*Phacelia ivesiana*  
*Phacelia lenta*  
*Phacelia leonis*  
*Phacelia linearis*  
*Phacelia lutea*  
*Phacelia lyallii*  
*Phacelia malvaefolia*  
*Phacelia minutissima*  
*Phacelia mutabilis*  
*Phacelia nemoralis*  
*Phacelia peckii*  
*Phacelia procera*  
*Phacelia ramosissima*  
*Phacelia rattanii*  
*Phacelia scopulina*  
*Phacelia sericea*  
*Phacelia tanacetifolia*  
*Phacelia tetramera*  
*Phacelia thermalis*  
*Phacelia verna*  
*Phacelia virgata*  
*Phalaris aquatica*  
*Phalaris arundinacea*  
*Phalaris californica*  
*Phalaris canariensis*  
*Phalaris caroliniana*  
*Phalaris minor*  
*Phalaris paradoxa*  
*Phaseolus coccineus*  
*Phaseolus vulgaris*  
*Philadelphus gordonianus*  
*Philadelphus lewisii*  
*Philadelphus oreganus*  
*Philadelphus pubescens*  
*Philadelphus trichothecus*  
*Philostemon radicans*  
*Phippsia algida*  
*Phleum alpinum*  
*Phleum boeheimeri*  
*Phleum phleoides*  
*Phleum pratense*  
*Phlomis tuberosa*  
*Phlox aculeata*  
*Phlox adsurgens*  
*Phlox albomarginata*  
*Phlox alyssifolia*  
*Phlox andicola*  
*Phlox austromontana*  
*Phlox bryoides*  
*Phlox caespitosa*

*Phlox caroliniensis*  
*Phlox colubria*  
*Phlox colubrina*  
*Phlox diffusa*  
*Phlox exuata*  
*Phlox gracilis*  
*Phlox hendersonii*  
*Phlox hirsuta*  
*Phlox hoodii*  
*Phlox idahonis*  
*Phlox kelseyi*  
*Phlox linearifolia*  
*Phlox longifolia*  
*Phlox multiflora*  
*Phlox musciodes*  
*Phlox paniculata*  
*Phlox peckii*  
*Phlox pilosa*  
*Phlox pungens*  
*Phlox speciosa*  
*Phlox variabilis*  
*Phlox viscida*  
*Phoenicaulis cheiranthoides*  
*Phoradendron bolleanum*  
*Phoradendron juniperinum*  
*Phragmites australis*  
*Phryma leptostachya*  
*Phyllanthus caroliniensis*  
*Phyllodoce X intermedia*  
*Phyllodoce empetriformis*  
*Phyllodoce glanduliflora*  
*Phyllospadix scouleri*  
*Physalis hederacefolia*  
*Physalis heterophylla*  
*Physalis ixocarpa*  
*Physalis longifolia*  
*Physalis peruviana*  
*Physalis philadelphica*  
*Physalis pruinosa*  
*Physalis pubescens*  
*Physalis pumila*  
*Physalis wrightii*  
*Physaria acutifolia*  
*Physaria alpestris*  
*Physaria brassicoides*  
*Physaria chambersii*  
*Physaria condensata*  
*Physaria didymocarpa*  
*Physaria dornii*  
*Physaria eburniflora*  
*Physaria geyeri*  
*Physaria integrifolia*  
*Physaria oregana*  
*Physaria saximontana*

*Physocarpus alternans*  
*Physocarpus capitatus*  
*Physocarpus malvaceus*  
*Physocarpus monogynus*  
*Physocarpus opulifolius*  
*Physostegia ledinghamii*  
*Physostegia parviflora*  
*Physostegia virginiana*  
*Phytolacca americana*  
*Picea abies*  
*Picea breweriana*  
*Picea engelmannii*  
*Picea glauca*  
*Picea pungens*  
*Picea sitchensis*  
*Picradeniopsis oppositifolia*  
*Picradeniopsis woodhousei*  
*Picris echinoides*  
*Picris hieracoides*  
*Pieris japonica*  
*Pilea fontana*  
*Pilea pumila*  
*Pilularia americana*  
*Pimpinella anisum*  
*Pimpinella saxifraga*  
*Pinguicula vulgaris*  
*Pinus albicaulis*  
*Pinus attenuata*  
*Pinus banksiana*  
*Pinus contorta*  
*Pinus flexilis*  
*Pinus jefferyi*  
*Pinus lambertiana*  
*Pinus monophylla*  
*Pinus monticola*  
*Pinus nigra*  
*Pinus ponderosa*  
*Pinus radiata*  
*Pinus sabiniana*  
*Pinus sylvestris*  
*Pinus thunbergiana*  
*Pinus wallichiana*  
*Pisum sativum*  
*Pityopus californica*  
*Pityrogramma triangularis*  
*Plagiobothrys figuratus*  
*Plagiobothrys greenei*  
*Plagiobothrys harknessii*  
*Plagiobothrys hirtus*  
*Plagiobothrys hispidus*  
*Plagiobothrys lamprocarpus*  
*Plagiobothrys leptocladus*  
*Plagiobothrys mollis*  
*Plagiobothrys nothofolius*

*Plagiobothrys reticulatus*  
*Plagiobothrys scouleri*  
*Plagiobothrys shastensis*  
*Plagiobothrys tenellus*  
*Plagiobothrys tener*  
*Plantago aristata*  
*Plantago asiatica*  
*Plantago canescens*  
*Plantago elongata*  
*Plantago eriopoda*  
*Plantago galeattiana*  
*Plantago hirtella*  
*Plantago lanceolata*  
*Plantago macrocarpa*  
*Plantago major*  
*Plantago maritima*  
*Plantago patagonica*  
*Plantago rugelii*  
*Plantago tweedyi*  
*Platanthera chorisiana*  
*Platanthera praeclara*  
*Platanthera sparsiflora*  
*Platanus occidentalis*  
*Platyschkuhria integrifolia*  
*Platyspermum scapigerum*  
*Plectritis ciliosa*  
*Plectritis congesta*  
*Plectritis macrocera*  
*Pleuricospora fimbriolata*  
*Pleuropogon davyi*  
*Pleuropogon oregonus*  
*Pleuropogon refractus*  
*Poa abbreviata*  
*Poa alpina*  
*Poa annua*  
*Poa arachnifera*  
*Poa arctica*  
*Poa arida*  
*Poa bolanderi*  
*Poa bulbosa*  
*Poa compressa*  
*Poa confinis*  
*Poa curta*  
*Poa curtifolia*  
*Poa epilip*  
*Poa fendleriana*  
*Poa glauca*  
*Poa glaucifolia*  
*Poa howellii*  
*Poa laxiflora*  
*Poa leibergii*  
*Poa leptocoma*  
*Poa lettermanii*  
*Poa longifolia*

*Poa longiligula*  
*Poa macrantha*  
*Poa macroclada*  
*Poa marcida*  
*Poa nervosa*  
*Poa pachypholis*  
*Poa palustris*  
*Poa patersonii*  
*Poa paucispicula*  
*Poa piperi*  
*Poa pratensis*  
*Poa pringlei*  
*Poa reflexa*  
*Poa rhizomata*  
*Poa rupicola*  
*Poa secunda*  
*Poa stenantha*  
*Poa suksdorfii*  
*Poa sylvestris*  
*Poa trivialis*  
*Poa unilateralis*  
*Poa vaseyochloa*  
*Pogogyne zizyphoroides*  
*Pogonia ophioglossoides*  
*Polanisia jamesii*  
*Polanisia trachysperma*  
*Polemonium brandegei*  
*Polemonium californicum*  
*Polemonium carneum*  
*Polemonium chartaceum*  
*Polemonium elegans*  
*Polemonium foliosissimum*  
*Polemonium micranthum*  
*Polemonium occidentale*  
*Polemonium pectinatum*  
*Polemonium pulcherrimum*  
*Polemonium reptans*  
*Polemonium viscosum*  
*Polyctenium fremontii*  
*Polygala alba*  
*Polygala californica*  
*Polygala sanguinea*  
*Polygala senega*  
*Polygala verticillata*  
*Polygonatum biflorum*  
*Polygonum achoreum*  
*Polygonum amphibium*  
*Polygonum argyroleon*  
*Polygonum aubertii*  
*Polygonum austinae*  
*Polygonum aviculare*  
*Polygonum bistortoides*  
*Polygonum californicum*  
*Polygonum cascadenense*

*Polygonum coccineum*  
*Polygonum confertiflorum*  
*Polygonum convolvulus*  
*Polygonum cuspidatum*  
*Polygonum davisiae*  
*Polygonum douglasii*  
*Polygonum erectum*  
*Polygonum fowleri*  
*Polygonum heterosepalum*  
*Polygonum hydropiper*  
*Polygonum hydropiperoides*  
*Polygonum kelloggii*  
*Polygonum lapathifolium*  
*Polygonum majus*  
*Polygonum minimum*  
*Polygonum montanum*  
*Polygonum newberryi*  
*Polygonum nudum*  
*Polygonum nuttallii*  
*Polygonum orientale*  
*Polygonum paronychia*  
*Polygonum parryi*  
*Polygonum pensylvanicum*  
*Polygonum persicaria*  
*Polygonum phytolaccaefolium*  
*Polygonum polyacnoides*  
*Polygonum polygaloides*  
*Polygonum polystachyum*  
*Polygonum punctatum*  
*Polygonum ramosissimum*  
*Polygonum sachalinense*  
*Polygonum sagittatum*  
*Polygonum sawatchense*  
*Polygonum scandens*  
*Polygonum spargulariaeforme*  
*Polygonum tenue*  
*Polygonum viviparum*  
*Polygonum watsonii*  
*Polypodium glycyrrhiza*  
*Polypodium hesperium*  
*Polypodium scolieri*  
*Polypodium virginianum*  
*Polypogon distans*  
*Polypogon glomeratus*  
*Polypogon interruptus*  
*Polypogon monspeliensis*  
*Polystichum andersonii*  
*Polystichum braunii*  
*Polystichum californicum*  
*Polystichum kruckebergii*  
*Polystichum lemmonii*  
*Polystichum lonchitis*  
*Polystichum mohrioides*  
*Polystichum munitum*

*Polystichum scopulinum*  
*Poncirus trifoliata*  
*Ponista oregonensis*  
*Populus X acuminata*  
*Populus X brayshawii*  
*Populus X canadensis*  
*Populus alba*  
*Populus angustifolia*  
*Populus balsamifera*  
*Populus deltoides*  
*Populus fremontii*  
*Populus tremuloides*  
*Porterella carnosula*  
*Portulaca oleracea*  
*Potamogeton alpinus*  
*Potamogeton amplifolius*  
*Potamogeton bertholdii*  
*Potamogeton crispus*  
*Potamogeton diversifolius*  
*Potamogeton epihydrus*  
*Potamogeton filiformis*  
*Potamogeton foliosus*  
*Potamogeton friesii*  
*Potamogeton gramineus*  
*Potamogeton illinoensis*  
*Potamogeton natans*  
*Potamogeton nodosus*  
*Potamogeton obtusifolius*  
*Potamogeton pauciflorus*  
*Potamogeton pectinatus*  
*Potamogeton praelongus*  
*Potamogeton pusillus*  
*Potamogeton richardsonii*  
*Potamogeton robbinsii*  
*Potamogeton strictifolius*  
*Potamogeton vaginatus*  
*Potamogeton zosteriformis*  
*Potentilla anserina*  
*Potentilla argentea*  
*Potentilla arguta*  
*Potentilla bakeri*  
*Potentilla biennis*  
*Potentilla blaschkeana*  
*Potentilla brevifolia*  
*Potentilla breweri*  
*Potentilla cascadenis*  
*Potentilla concinna*  
*Potentilla corymbosa*  
*Potentilla cottamii*  
*Potentilla diversifolia*  
*Potentilla drummondii*  
*Potentilla etomentosa*  
*Potentilla fastigiata*  
*Potentilla fissa*

*Potentilla flabellifolia*  
*Potentilla fruticosa*  
*Potentilla glabrata*  
*Potentilla glandulosa*  
*Potentilla glaucophylla*  
*Potentilla gracilis*  
*Potentilla hippiana*  
*Potentilla hookeriana*  
*Potentilla nepalensis*  
*Potentilla newberryi*  
*Potentilla nivea*  
*Potentilla norvegica*  
*Potentilla ovina*  
*Potentilla pacifica*  
*Potentilla palustris*  
*Potentilla paradoxa*  
*Potentilla pensylvanica*  
*Potentilla permollis*  
*Potentilla plattensis*  
*Potentilla pumila*  
*Potentilla quinquefolia*  
*Potentilla recta*  
*Potentilla rhomboidea*  
*Potentilla rivalis*  
*Potentilla rubricaulis*  
*Potentilla tridentata*  
*Potentilla uniflora*  
*Potentilla valida*  
*Potentilla villosa*  
*Prenanthes alata*  
*Prenanthes alba*  
*Prenanthes aspera*  
*Prenanthes racemosa*  
*Prenanthes sagittata*  
*Primula alcalina*  
*Primula cusickiana*  
*Primula incana*  
*Primula parryi*  
*Primula wilcoxiana*  
*Prinspeia uniflora*  
*Proboscidea louisianica*  
*Prosartes hookeri*  
*Prunella vulgaris*  
*Prunus americana*  
*Prunus armeniaca*  
*Prunus avium*  
*Prunus cerasifera*  
*Prunus cerasus*  
*Prunus domestica*  
*Prunus emarginata*  
*Prunus fruticosa*  
*Prunus glandulosa*  
*Prunus laurocerasus*  
*Prunus lusitanica*

*Prunus mahaleb*  
*Prunus padus*  
*Prunus pensylvanica*  
*Prunus persica*  
*Prunus prunifolia*  
*Prunus pumila*  
*Prunus spinosa*  
*Prunus subcordata*  
*Prunus tomentosa*  
*Prunus virginiana*  
*Pseudelymus X saxicola*  
*Pseudotsuga menziesii*  
*Pseudotsuga taxifolia*  
*Psilocarphus brevissimus*  
*Psilocarphus elatior*  
*Psilocarphus oregonus*  
*Psilocarphus tenellus*  
*Psilostrophe bakeri*  
*Psoralea argophylla*  
*Psoralea cuspidata*  
*Psoralea esculenta*  
*Psoralea hypogaea*  
*Psoralea lanceolata*  
*Psoralea linearifolia*  
*Psoralea physodes*  
*Psoralea tenuiflora*  
*Pteritis spicant*  
*Pteridium aquilinum*  
*Pterospora andromedea*  
*Pteryxia petraea*  
*Puccinellia airoides*  
*Puccinellia cusickii*  
*Puccinellia distans*  
*Puccinellia lemmonii*  
*Puccinellia maritima*  
*Puccinellia nutkaensis*  
*Puccinellia nuttalliana*  
*Puccinellia pauciflora*  
*Puccinellia pumila*  
*Purshia mexicana*  
*Purshia tridentata*  
*Pycnanthemum californicum*  
*Pycnanthemum virginianum*  
*Pyrola aphylla*  
*Pyrola asarifolia*  
*Pyrola chlorantha*  
*Pyrola dentata*  
*Pyrola elliptica*  
*Pyrola minor*  
*Pyrola pallida*  
*Pyrola picta*  
*Pyrola rotundifolia*  
*Pyrola secunda*  
*Pyrola uniflora*

*Pyrrocoma lanceolata*  
*Pyrus calleryana*  
*Pyrus communis*  
*Pyrus ioensis*  
*Pyrus malus*  
*Pyrus sylvestris*  
*Quamasia azurea*  
*Quercus bicolor*  
*Quercus chrysolepis*  
*Quercus garryana*  
*Quercus kelloggii*  
*Quercus macrocarpa*  
*Quercus morehus*  
*Quercus robur*  
*Quercus sadleriana*  
*Quercus vaccinifolia*  
*Raillardella argentea*  
*Raillardella scaposa*  
*Rainiera stricta*  
*Ranunculus abortivus*  
*Ranunculus acriformis*  
*Ranunculus acris*  
*Ranunculus alismaefolius*  
*Ranunculus andersonii*  
*Ranunculus aquatilis*  
*Ranunculus arvensis*  
*Ranunculus bongardii*  
*Ranunculus bulbosus*  
*Ranunculus californicus*  
*Ranunculus cardiophyllus*  
*Ranunculus cooleyae*  
*Ranunculus cymbalaria*  
*Ranunculus douglasii*  
*Ranunculus eschscholtzii*  
*Ranunculus ficaria*  
*Ranunculus flabellaris*  
*Ranunculus flammula*  
*Ranunculus gelidus*  
*Ranunculus glaberrimus*  
*Ranunculus gmelinii*  
*Ranunculus gormanii*  
*Ranunculus hebecarpus*  
*Ranunculus hispidus*  
*Ranunculus hyperboreus*  
*Ranunculus inamoenus*  
*Ranunculus intertextus*  
*Ranunculus jovis*  
*Ranunculus lobbii*  
*Ranunculus macounii*  
*Ranunculus muricatus*  
*Ranunculus natans*  
*Ranunculus occidentalis*  
*Ranunculus oresterus*  
*Ranunculus orthorhynchus*

*Ranunculus parviflorus*  
*Ranunculus pedatifidus*  
*Ranunculus pensylvanicus*  
*Ranunculus populago*  
*Ranunculus purshii*  
*Ranunculus pygmaeus*  
*Ranunculus reconditus*  
*Ranunculus recurvatus*  
*Ranunculus repens*  
*Ranunculus reptans*  
*Ranunculus rhomboideus*  
*Ranunculus sceleratus*  
*Ranunculus subgrigidus*  
*Ranunculus testiculatus*  
*Ranunculus unalaschensis*  
*Ranunculus uncinatus*  
*Ranunculus verecundus*  
*Raphanus raphanistrum*  
*Raphanus sativus*  
*Ratibida columnifera*  
*Ratibida pinnata*  
*Redfieldia flexuosa*  
*Reseda lutea*  
*Rhamnus alnifolia*  
*Rhamnus californica*  
*Rhamnus cathartica*  
*Rhamnus davurica*  
*Rhamnus frangula*  
*Rhamnus purshiana*  
*Rheum rhabarbarum*  
*Rhinanthus crista-galli*  
*Rhododendron albiflorum*  
*Rhododendron macrophyllum*  
*Rhododendron occidentale*  
*Rhus copallina*  
*Rhus diversiloba*  
*Rhus glabra*  
*Rhus quercifolia*  
*Rhus trilobata*  
*Rhus typhina*  
*Rhynchospora alba*  
*Rhynchospora capillacea*  
*Rhysopertus plurijugus*  
*Ribes acerifolium*  
*Ribes alpinum*  
*Ribes americanum*  
*Ribes aureum*  
*Ribes binominatum*  
*Ribes bracteosum*  
*Ribes cereum*  
*Ribes cognatum*  
*Ribes cruentum*  
*Ribes cynosbati*  
*Ribes divaricatum*

*Ribes erythrocarpum*  
*Ribes gooddingii*  
*Ribes hendersonii*  
*Ribes hirtellum*  
*Ribes howellii*  
*Ribes hudsonianum*  
*Ribes indecorum*  
*Ribes inerme*  
*Ribes irriguum*  
*Ribes klamathense*  
*Ribes lacustre*  
*Ribes laxiflorum*  
*Ribes lobbiai*  
*Ribes marshallii*  
*Ribes menziesii*  
*Ribes missouriense*  
*Ribes mogollonicum*  
*Ribes montigenum*  
*Ribes nevadense*  
*Ribes nigrum*  
*Ribes niveum*  
*Ribes oxycanthoides*  
*Ribes petiolare*  
*Ribes reniforme*  
*Ribes sanguineum*  
*Ribes sativum*  
*Ribes setosum*  
*Ribes triste*  
*Ribes velutinum*  
*Ribes viscosissimum*  
*Ribes watsonianum*  
*Ribes wolffii*  
*Ricinus communis*  
*Rigiopappus leptocladus*  
*Robinia hispida*  
*Robinia pseudo-acacia*  
*Robinia viscosa*  
*Romanzoffia californica*  
*Romanzoffia sitchensis*  
*Romanzoffia suksdorfii*  
*Romanzoffia thompsonii*  
*Romanzoffia tracyi*  
*Rorippa austriaca*  
*Rorippa calycina*  
*Rorippa curvipes*  
*Rorippa lyrata*  
*Rorippa palustris*  
*Rorippa sinuata*  
*Rorippa sylvestris*  
*Rorippa tenerrima*  
*Rorippa truncata*  
*Rosa acicularis*  
*Rosa arkansana*  
*Rosa blanda*

*Rosa californica*  
*Rosa canina*  
*Rosa eglanteria*  
*Rosa gymnocarpa*  
*Rosa multiflora*  
*Rosa nutkana*  
*Rosa pisocarpa*  
*Rosa pyrifera*  
*Rosa spaldingii*  
*Rosa spithamea*  
*Rosa ultramontana*  
*Rosa virginiana*  
*Rosa woodsii*  
*Rotala ramosior*  
*Rottboellia cochinchinensis*  
*Rottboellia exaltata*  
*Rubus acaulis*  
*Rubus bartonianus*  
*Rubus chamaemorus*  
*Rubus discolor*  
*Rubus fruticosus*  
*Rubus hesperius*  
*Rubus idaeus*  
*Rubus laciniatus*  
*Rubus lasiococcus*  
*Rubus leucodermis*  
*Rubus macropetalus*  
*Rubus macrophyllus*  
*Rubus molluccanus*  
*Rubus nigerrimus*  
*Rubus nivalis*  
*Rubus occidentalis*  
*Rubus parviflorus*  
*Rubus pedatus*  
*Rubus procerus*  
*Rubus pubescens*  
*Rubus spectabilis*  
*Rubus strigosus*  
*Rubus thrysanthus*  
*Rubus ursinus*  
*Rubus vestitus*  
*Rudbeckia alpicola*  
*Rudbeckia californica*  
*Rudbeckia hirta*  
*Rudbeckia laciniata*  
*Rudbeckia nitida*  
*Rudbeckia occidentalis*  
*Rumex acetosa*  
*Rumex acetosella*  
*Rumex altissimus*  
*Rumex aquaticus*  
*Rumex conglomeratus*  
*Rumex crispus*  
*Rumex cuneifolius*

*Rumex densiflorus*  
*Rumex domesticus*  
*Rumex maritimus*  
*Rumex obtusifolius*  
*Rumex occidentalis*  
*Rumex orbiculatus*  
*Rumex patientia*  
*Rumex paucifolius*  
*Rumex persicarioides*  
*Rumex pulcher*  
*Rumex salicifolius*  
*Rumex sanguineus*  
*Rumex stenophyllus*  
*Rumex venosus*  
*Ruppia maritima*  
*Ruppia occidentalis*  
*Ruscus hypoglossum*  
*Saccharum spontaneum*  
*Sagina apetala*  
*Sagina crassicaulis*  
*Sagina nivalis*  
*Sagina occidentalis*  
*Sagina procumbens*  
*Sagina saginoides*  
*Sagittaria arifolia*  
*Sagittaria brevirostra*  
*Sagittaria calycina*  
*Sagittaria cuneata*  
*Sagittaria graminea*  
*Sagittaria latifolia*  
*Sagittaria montevidensis*  
*Sagittaria sagittifolia*  
*Sairocarpus kingii*  
*Salicornia europaea*  
*Salicornia rubra*  
*Salicornia virginica*  
*Salix X clarkei*  
*Salix alba*  
*Salix amygdaloides*  
*Salix arctica*  
*Salix argophylla*  
*Salix babylonica*  
*Salix barclayi*  
*Salix barrattiana*  
*Salix bebbiana*  
*Salix boothii*  
*Salix brachycarpa*  
*Salix candida*  
*Salix cascadiensis*  
*Salix caudata*  
*Salix commutata*  
*Salix coulteri*  
*Salix delnortensis*  
*Salix discolor*

*Salix drummondiana*  
*Salix eastwoodiae*  
*Salix eriocephala*  
*Salix exigua*  
*Salix farriac*  
*Salix fluviatilis*  
*Salix fragilis*  
*Salix geyeriana*  
*Salix glauca*  
*Salix hinsiana*  
*Salix hookeriana*  
*Salix humilis*  
*Salix jepsonii*  
*Salix laevigata*  
*Salix lasiandra*  
*Salix lasiolepis*  
*Salix lemmoni*  
*Salix lemmonii*  
*Salix lucida*  
*Salix lutea*  
*Salix maccalliana*  
*Salix mackenziana*  
*Salix monochroma*  
*Salix nivalis*  
*Salix parksiana*  
*Salix pedicellaris*  
*Salix pentandra*  
*Salix petiolaris*  
*Salix petrophila*  
*Salix piperi*  
*Salix planifolia*  
*Salix pseudocordata*  
*Salix pseudomonticola*  
*Salix rigida*  
*Salix rotundifolia*  
*Salix scouleriana*  
*Salix serissima*  
*Salix sessilifolia*  
*Salix sitchensis*  
*Salix tracyi*  
*Salix tweedyi*  
*Salix vestita*  
*Salix wolfii*  
*Salsola collina*  
*Salsola iberica*  
*Salsola vermiculata*  
*Salvia X sylvestris*  
*Salvia aethiopis*  
*Salvia camosa*  
*Salvia dorrii*  
*Salvia microphylla*  
*Salvia nemorosa*  
*Salvia officinalis*  
*Salvia pratensis*

*Salvia reflexa*  
*Salvia sclarea*  
*Salvinia auriculata*  
*Salvinia biloba*  
*Salvinia herzogii*  
*Salvinia molesta*  
*Sambucus arborescens*  
*Sambucus callicarpa*  
*Sambucus canadensis*  
*Sambucus cerulea*  
*Sambucus glauca*  
*Sambucus melanocarpa*  
*Sambucus racemosa*  
*Samolus parviflorus*  
*Sanguinaria canadensis*  
*Sanguisorba annua*  
*Sanguisorba menziesii*  
*Sanguisorba microcephala*  
*Sanguisorba minor*  
*Sanguisorba officinalis*  
*Sanguisorba sitchensis*  
*Sanicula arctopoides*  
*Sanicula bipinnatifida*  
*Sanicula canadensis*  
*Sanicula crassicaulis*  
*Sanicula graveolens*  
*Sanicula gregaria*  
*Sanicula laciniata*  
*Sanicula marilandica*  
*Sanicula peckiana*  
*Sanicula septentrionalis*  
*Sanicula tracyi*  
*Sanicula tuberosa*  
*Saponaria ocyroides*  
*Saponaria officinalis*  
*Sarcobatus vermiculatus*  
*Sarcococca hookeriana*  
*Sarcococca hookeriana*  
*Sarcodes sanguinea*  
*Satureja acinos*  
*Satureja douglasii*  
*Satureja vulgaris*  
*Saussurea americana*  
*Saussurea densa*  
*Saussurea weberi*  
*Saxifraga adscendens*  
*Saxifraga aequidentata*  
*Saxifraga aestivalis*  
*Saxifraga aizoides*  
*Saxifraga apetala*  
*Saxifraga arguta*  
*Saxifraga austromontana*  
*Saxifraga bongardii*  
*Saxifraga bronchialis*

*Saxifraga bryophora*  
*Saxifraga caespitosa*  
*Saxifraga californica*  
*Saxifraga cernua*  
*Saxifraga cherlerioides*  
*Saxifraga chrysantha*  
*Saxifraga columbiana*  
*Saxifraga debilis*  
*Saxifraga ferruginea*  
*Saxifraga flagellaris*  
*Saxifraga foliolosa*  
*Saxifraga fragarioides*  
*Saxifraga fragosa*  
*Saxifraga hieracifolia*  
*Saxifraga howellii*  
*Saxifraga incompta*  
*Saxifraga integrifolia*  
*Saxifraga jamesii*  
*Saxifraga lyallii*  
*Saxifraga marshallii*  
*Saxifraga mertensiana*  
*Saxifraga nuttallii*  
*Saxifraga occidentalis*  
*Saxifraga oppositifolia*  
*Saxifraga oregana*  
*Saxifraga parvifolia*  
*Saxifraga peltata*  
*Saxifraga punctata*  
*Saxifraga ranunculifolia*  
*Saxifraga reflexa*  
*Saxifraga rhomboidea*  
*Saxifraga rivularis*  
*Saxifraga rufidula*  
*Saxifraga subpetala*  
*Saxifraga tempestiva*  
*Saxifraga tischii*  
*Saxifraga tolmiei*  
*Saxifraga tricuspidata*  
*Saxifragopsis fragarioides*  
*Scabiosa atropurpurea*  
*Scandix pecten-veneris*  
*Schedonardus paniculatus*  
*Scheuchzeria palustris*  
*Schizachne purpurascens*  
*Schoenocrambe linifolia*  
*Schoenolirion album*  
*Schoenolirion bracteosum*  
*Schrankia nuttallii*  
*Scilla siberica*  
*Scirpus acutus*  
*Scirpus atrovirens*  
*Scirpus cernuus*  
*Scirpus cespitosus*  
*Scirpus condonii*

*Scirpus criniger*  
*Scirpus cyperinus*  
*Scirpus fluvialis*  
*Scirpus hallii*  
*Scirpus heterochaetus*  
*Scirpus hudsonianus*  
*Scirpus maritimus*  
*Scirpus microcarpus*  
*Scirpus nevadensis*  
*Scirpus pallidus*  
*Scirpus pauciflorus*  
*Scirpus pendulus*  
*Scirpus pumilus*  
*Scirpus pungens*  
*Scirpus setaceus*  
*Scirpus subterminalis*  
*Scirpus validus*  
*Scleranthus annuus*  
*Sclerochloa dura*  
*Scleropoa rigida*  
*Scolopos hallii*  
*Scolochloa festuacea*  
*Scorzonera hispanica*  
*Scorzonera laciniata*  
*Scribneria bolanderi*  
*Scrophularia californica*  
*Scrophularia lanceolata*  
*Scutellaria angustifolia*  
*Scutellaria antirrhinoides*  
*Scutellaria epilobiifolia*  
*Scutellaria galericulata*  
*Scutellaria lateriflora*  
*Scutellaria nana*  
*Scutellaria parvula*  
*Scutellaria tuberosa*  
*Secale cereale*  
*Sedum acre*  
*Sedum debile*  
*Sedum divergens*  
*Sedum glanduliferum*  
*Sedum lanceolatum*  
*Sedum laxum*  
*Sedum leibergii*  
*Sedum lineare*  
*Sedum moranii*  
*Sedum oblancoletum*  
*Sedum oreganum*  
*Sedum oregonense*  
*Sedum purdyi*  
*Sedum purdyiifolius*  
*Sedum radiatum*  
*Sedum rhodanthum*  
*Sedum rosea*  
*Sedum spathulifolium*

*Sedum spectabile*  
*Sedum stenopetalum*  
*Sedum telephium*  
*Sedum watsoni*  
*Selaginella densa*  
*Selaginella douglasii*  
*Selaginella oregana*  
*Selaginella rupestris*  
*Selaginella selaginoides*  
*Selaginella wallacei*  
*Selaginella watsonii*  
*Senecio amplexans*  
*Senecio aronicoides*  
*Senecio atratus*  
*Senecio aureus*  
*Senecio bolanderi*  
*Senecio canus*  
*Senecio clarkianus*  
*Senecio columbianus*  
*Senecio condensatus*  
*Senecio congestus*  
*Senecio crassulus*  
*Senecio cymbalarioides*  
*Senecio debilis*  
*Senecio dimorphophyllus*  
*Senecio elmeri*  
*Senecio eremophilus*  
*Senecio etterae*  
*Senecio eurycephalus*  
*Senecio fendleri*  
*Senecio flavulus*  
*Senecio flettii*  
*Senecio foetidus*  
*Senecio fremontii*  
*Senecio fuscatus*  
*Senecio hesperius*  
*Senecio howellii*  
*Senecio hydrophiloides*  
*Senecio hydrophilus*  
*Senecio hyperborealis*  
*Senecio indecorus*  
*Senecio integerrimus*  
*Senecio integrifolius*  
*Senecio jacobaea*  
*Senecio laetiflorus*  
*Senecio liguliflorus*  
*Senecio ligulifolius*  
*Senecio lugens*  
*Senecio macounii*  
*Senecio megacephalus*  
*Senecio mikanoides*  
*Senecio multilobatus*  
*Senecio neowebsteri*  
*Senecio pauciflorus*

*Senecio pauperculus*  
*Senecio plattensis*  
*Senecio porteri*  
*Senecio pseudoreus*  
*Senecio purshianus*  
*Senecio rapifolius*  
*Senecio resedifolius*  
*Senecio riddellii*  
*Senecio serra*  
*Senecio sonnei*  
*Senecio spartioides*  
*Senecio sphaerocephalus*  
*Senecio streptanthifolius*  
*Senecio subnudus*  
*Senecio sylvaticus*  
*Senecio triangularis*  
*Senecio tridenticulatus*  
*Senecio tweedyi*  
*Senecio uintahensis*  
*Senecio viscosus*  
*Senecio vulgaris*  
*Senecio websteri*  
*Senecio werneriifolius*  
*Sequoia sempervirens*  
*Serapias austriacae*  
*Sesuvium verrucosum*  
*Setaria glauca*  
*Setaria italica*  
*Setaria pallide-fusca*  
*Setaria verticillata*  
*Setaria viridis*  
*Setcreasea pallida*  
*Shepherdia argentea*  
*Shepherdia canadensis*  
*Sherardia arvensis*  
*Shinnersoseris rostrata*  
*Shoshonea pulvinata*  
*Sibbaldia procumbens*  
*Sicyos angulatus*  
*Sida hederacea*  
*Sidalcea campestris*  
*Sidalcea crenulata*  
*Sidalcea cusickii*  
*Sidalcea eximia*  
*Sidalcea glaucescens*  
*Sidalcea hendersonii*  
*Sidalcea hirtipes*  
*Sidalcea malachroides*  
*Sidalcea malviflora*  
*Sidalcea nelsoniana*  
*Sidalcea neomexicana*  
*Sidalcea oregana*  
*Sidalcea ranunculacea*  
*Sidalcea setosa*

*Sidalcea spicata*  
*Sidalcea virgata*  
*Sideritis montana*  
*Sildacea candida*  
*Silene acaulis*  
*Silene antirrhina*  
*Silene armeria*  
*Silene californica*  
*Silene campanulata*  
*Silene columbiana*  
*Silene conoidea*  
*Silene cserei*  
*Silene dichotoma*  
*Silene douglasii*  
*Silene gallica*  
*Silene grayi*  
*Silene hitchguirei*  
*Silene hookeri*  
*Silene ingrami*  
*Silene latifolia*  
*Silene lemmonii*  
*Silene lyallii*  
*Silene macounii*  
*Silene menziesii*  
*Silene montana*  
*Silene multicaulis*  
*Silene noctiflora*  
*Silene oregana*  
*Silene parryi*  
*Silene repens*  
*Silene scaposa*  
*Silene scouleri*  
*Silene seelyi*  
*Silene spaldingii*  
*Silene suksdorfii*  
*Silene vulgaris*  
*Silphium laciniatum*  
*Silphium perfoliatum*  
*Silybum marianum*  
*Sisymbrium altissimum*  
*Sisymbrium irio*  
*Sisymbrium loeselii*  
*Sisymbrium officinale*  
*Sisyrinchium bellum*  
*Sisyrinchium californicum*  
*Sisyrinchium campestre*  
*Sisyrinchium douglasii*  
*Sisyrinchium halophilum*  
*Sisyrinchium hendersonii*  
*Sisyrinchium hitchcockii*  
*Sisyrinchium idahoense*  
*Sisyrinchium inflatum*  
*Sisyrinchium montanum*  
*Sisyrinchium mucronatum*

*Sisyrinchium pallidum*  
*Sisyrinchium sarmentosum*  
*Sisyrinchium septentrionale*  
*Sitanion henseni*  
*Sitanion hordeoides*  
*Sitanion hystrix*  
*Sitanion jubatum*  
*Sitanion longifolium*  
*Sium suave*  
*Skimmia japonica*  
*Smelowskia calycina*  
*Smelowskia fremontii*  
*Smelowskia ovalis*  
*Smilacina racemosa*  
*Smilacina sessilifolia*  
*Smilacina stellata*  
*Smilax californica*  
*Smilax ecirrhata*  
*Smilax herbacea*  
*Smilax jamesii*  
*Sobaria sorbifolia*  
*Solanum aviculare*  
*Solanum carolinense*  
*Solanum dulcamara*  
*Solanum elaeagnifolium*  
*Solanum furcatum*  
*Solanum interius*  
*Solanum melanocerasum*  
*Solanum melongena*  
*Solanum muricatum*  
*Solanum muticum*  
*Solanum nigrum*  
*Solanum parishii*  
*Solanum physalifolium*  
*Solanum pseudo-capsicum*  
*Solanum rostratum*  
*Solanum sarrachoides*  
*Solanum sisymbriifolium*  
*Solanum torvum*  
*Solanum triflorum*  
*Solanum tuberosum*  
*Solanum umbelliferum*  
*Solanum xanthii*  
*Solidago californica*  
*Solidago canadensis*  
*Solidago ciliosa*  
*Solidago decumbens*  
*Solidago flexicaulis*  
*Solidago gigantea*  
*Solidago glutinosa*  
*Solidago graminifolia*  
*Solidago gymnospermoides*  
*Solidago missouriensis*  
*Solidago mollis*

*Solidago multiradiata*  
*Solidago nana*  
*Solidago nemoralis*  
*Solidago occidentalis*  
*Solidago parryi*  
*Solidago ptarmicoides*  
*Solidago riddellii*  
*Solidago rigida*  
*Solidago scopulorum*  
*Solidago simplex*  
*Solidago sparsiflora*  
*Solidago spathulata*  
*Solidago speciosa*  
*Solidago spectabilis*  
*Soliva pterosperma*  
*Sonchus arvensis*  
*Sonchus asper*  
*Sonchus oleraceus*  
*Sophia parviflora*  
*Sophora arizonica*  
*Sophora japonica*  
*Sophora leachiana*  
*Sophora secundiflora*  
*Sorbus aria*  
*Sorbus aucuparia*  
*Sorbus cascadiensis*  
*Sorbus dumosa*  
*Sorbus hybrida*  
*Sorbus intermedia*  
*Sorbus occidentalis*  
*Sorbus sambucifolia*  
*Sorbus scopulina*  
*Sorbus sitchensis*  
*Sorghastrum nutans*  
*Sorghum alum*  
*Sorghum bicolor*  
*Sorghum halepense*  
*Sorghum sudanense*  
*Sparganium androcladum*  
*Sparganium angustifolium*  
*Sparganium chlorocarpum*  
*Sparganium emersum*  
*Sparganium erectum*  
*Sparganium eurycarpum*  
*Sparganium fluctuans*  
*Sparganium minimum*  
*Sparganium simplex*  
*Spartina alterniflora*  
*Spartina anglica*  
*Spartina gracilis*  
*Spartina patens*  
*Spartina pectinata*  
*Spartium junceum*  
*Spartium scoparium*

Spargula arvensis  
 Spargularia canadensis  
 Spargularia diandra  
 Spargularia macrotheca  
 Spargularia marina  
 Spargularia media  
 Spargularia rubra  
 Sphaeralcea angustifolia  
 Sphaeralcea coccinea  
 Sphaeralcea emoryi  
 Sphaeralcea grossularifolia  
 Sphaeralcea longisepala  
 Sphaeralcea munroana  
 Sphaeralcea parvifolia  
 Sphaeralcea rivularis  
 Sphaeromeria argentea  
 Sphaeromeria capitata  
 Sphaeromeria potentilloides  
 Sphaerophysa salsula  
 Sphenopholis obtusata  
 Sphenosciadium capitellatum  
 Spinacea oleracea  
 Spiraea X arguta  
 Spiraea X bumalda  
 Spiraea X pyramidata  
 Spiraea X vanhouttei  
 Spiraea alba  
 Spiraea arbuscula  
 Spiraea betulifolia  
 Spiraea densiflora  
 Spiraea douglasii  
 Spiraea japonica  
 Spiraea lucida  
 Spiraea menziesii  
 Spiraea pikowensis  
 Spiraea pyramidata  
 Spiraea roseata  
 Spiranthus cernua  
 Spiranthus magnicarpum  
 Spiranthus porrifolia  
 Spiranthus romanzoffiana  
 Spirodela polyrrhiza  
 Sporobolus airoides  
 Sporobolus asper  
 Sporobolus cryptandrus  
 Sporobolus heterolepis  
 Sporobolus neglectus  
 Sporobolus vaginiflorus  
 Spraguea nuda  
 Spraguea umbellata  
 Stachys albens  
 Stachys byzantina  
 Stachys ciliata  
 Stachys cooleyae

Stachys mexicana  
 Stachys palustris  
 Stachys rigida  
 Stachys scopulorum  
 Stachys tenuifolia  
 Stanleya confertiflora  
 Stanleya confertifolia  
 Stanleya pinnata  
 Stanleya tomentosa  
 Stanleya viridiflora  
 Steironema ciliatum  
 Steironema lanceolatum  
 Stellaria americana  
 Stellaria borealis  
 Stellaria calycantha  
 Stellaria crassifolia  
 Stellaria crispa  
 Stellaria graminea  
 Stellaria humifusa  
 Stellaria jamesiana  
 Stellaria laeta  
 Stellaria longifolia  
 Stellaria longipes  
 Stellaria media  
 Stellaria nitens  
 Stellaria obtusa  
 Stellaria simcoeii  
 Stellaria umbellata  
 Stenanthium occidentale  
 Stenogonum salsuginosum  
 Stenosiphon linifolius  
 Stephanie macho  
 Stephanomeria exigua  
 Stephanomeria lactucina  
 Stephanomeria malheurenensis  
 Stephanomeria paniculata  
 Stephanomeria runcinata  
 Stephanomeria tenuifolia  
 Stephanomeria virgata  
 Stipa columbiana  
 Stipa comata  
 Stipa curtisetia  
 Stipa elmeri  
 Stipa lemmonii  
 Stipa lettermanii  
 Stipa nevadensis  
 Stipa occidentalis  
 Stipa pinetorum  
 Stipa richardsonii  
 Stipa robusta  
 Stipa scribneri  
 Stipa spartea  
 Stipa speciosa  
 Stipa thurberiana

Stipa viridula  
 Stipa webberii  
 Stipa williamsii  
 Stiporyzopsis X bloomeri  
 Stratiotes aloides  
 Streptanthella longirostris  
 Streptanthus cordatus  
 Streptanthus glandulosus  
 Streptanthus howellii  
 Streptopus amplexifolius  
 Streptopus curvipes  
 Streptopus roseus  
 Streptopus streptopoides  
 Striga spp.  
 Strophostyles leiosperma  
 Stylocline filaginea  
 Stylocline psilocarphoides  
 Suaeda depressa  
 Suaeda diffusa  
 Suaeda maritima  
 Suaeda moquini  
 Suaeda nigra  
 Suaeda occidentalis  
 Subularia aquatica  
 Suckleya suckleyana  
 Suksdorfia ranunculifolia  
 Suksdorfia violacea  
 Sullivantia hapemanii  
 Sullivantia oregana  
 Sullivantia purpusii  
 Swertia albicaulis  
 Swertia modocensis  
 Swertia perennis  
 Symphoricarpos acutus  
 Symphoricarpos albus  
 Symphoricarpos longiflorus  
 Symphoricarpos mollis  
 Symphoricarpos occidentalis  
 Symphoricarpos orbiculatus  
 Symphoricarpos oreophilus  
 Symphoricarpos rotundifolius  
 Symphoricarpos vaccinioides  
 Symphytum asperum  
 Symphytum officinale  
 Synthyris canbyi  
 Synthyris missurica  
 Synthyris pinnatifida  
 Synthyris platycarpa  
 Synthyris reniformis  
 Synthyris rubra  
 Synthyris schizantha  
 Synthyris stellata  
 Syringa villosa  
 Syringa vulgaris

*Veronica wormskjoldii*  
*Veronicastrum virginicum*  
*Viburnum X burkwoodii*  
*Viburnum acerifolium*  
*Viburnum carlesii*  
*Viburnum dilatatum*  
*Viburnum edule*  
*Viburnum ellipticum*  
*Viburnum lanata*  
*Viburnum lentago*  
*Viburnum opulus*  
*Viburnum pauciflorum*  
*Viburnum rafinesquianum*  
*Viburnum rhytidophyllum*  
*Viburnum tinus*  
*Vicia americana*  
*Vicia californica*  
*Vicia cracca*  
*Vicia exigua*  
*Vicia faba*  
*Vicia gigantea*  
*Vicia hirsuta*  
*Vicia oregana*  
*Vicia pannonica*  
*Vicia sativa*  
*Vicia tetrasperma*  
*Vicia trifida*  
*Vicia truncata*  
*Vicia villosa*  
*Viguiera multiflora*  
*Vinca major*  
*Viola adunca*  
*Viola arvensis*  
*Viola bakeri*  
*Viola beckwithii*  
*Viola canadensis*  
*Viola cascadiensis*  
*Viola conspersa*  
*Viola cuneata*  
*Viola douglasii*  
*Viola flavovirens*  
*Viola flettii*  
*Viola glabella*  
*Viola hallii*  
*Viola howellii*  
*Viola lanceolata*  
*Viola langsdoorii*  
*Viola lobata*  
*Viola macloskeyi*  
*Viola montanensis*  
*Viola nephrophylla*  
*Viola nuttallii*  
*Viola occidentalis*  
*Viola ocellata*

*Viola odorata*  
*Viola orbiculata*  
*Viola palustris*  
*Viola pedatifida*  
*Viola pratincola*  
*Viola pubescens*  
*Viola purpurea*  
*Viola quercetorum*  
*Viola rafinesquii*  
*Viola renifolia*  
*Viola retrosabura*  
*Viola selkirkii*  
*Viola sempervirens*  
*Viola septentrionalis*  
*Viola sheltunii*  
*Viola sororia*  
*Viola trinervata*  
*Viola uncinulata*  
*Viola utahensis*  
*Vitis californica*  
*Vitis riparia*  
*Vitis vinifera*  
*Vitis vulpina*  
*Waldsteinia idahoensis*  
*Whipplea modesta*  
*Wolffia columbiana*  
*Wolffia punctata*  
*Wolffiella floridana*  
*Woodsia oregana*  
*Woodsia scopulina*  
*Woodsia scopulina*  
*Woodwardia fimbriata*  
*Wyethia X cusickii*  
*Wyethia amplexicaulis*  
*Wyethia angustifolia*  
*Wyethia helenioides*  
*Wyethia helianthoides*  
*Wyethia mollis*  
*Wyethia scabra*  
*X Agrohordeum macounii*  
*X Elyhordeum X macounii*  
*X Elyhordeum X montanense*  
*X Elyhordeum dakotense*  
*X Elycymus X aristatus*  
*Xanthium affine*  
*Xanthium saccharatum*  
*Xanthium spinosum*  
*Xanthium strumarium*  
*Xerophyllum tenax*  
*Xylorhiza glabriuscula*  
*Yermo xanthocephalus*  
*Yucca filamentosa*  
*Yucca glauca*  
*Zannichellia palustris*

*Zanthoxylum americanum*  
*Zauschneria californica*  
*Zauschneria latifolia*  
*Zigadenus elegans*  
*Zigadenus fremontii*  
*Zigadenus micranthus*  
*Zigadenus paniculatus*  
*Zigadenus venenosus*  
*Zizania aquatica*  
*Zizia aptera*  
*Zizia aurea*  
*Zostera marina*  
*Zostera nana*  
*Zosterella dubia*  
*Zoysia tenuifolia*  
*Zygophyllum fabago*

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